Charleston Lake Provincial Park

Master Plan

Ministry of Natural Resources
Ontario

CHARLESTON LAKE PROVINCIAL PARK

MASTER PLAN

Ontario

Office of the
Minister

Ministry of
Natural
Resources

416/965-1301

Whitney Block
Queen's Park
Toronto Ontario

Minister's Approval Statement

Changing recreational demands have created increased interest in mountains, lakes and forests in their natural setting. Natural environment parks have been designated to recognize such resource values while providing outdoor recreation activities. Charleston Lake Provincial Park is such a park.

Charleston Lake, whose landscape is more typical of areas farther north, has traditionally served as a recreational retreat. Historically, native hunting bands, nineteenth century recreationists, farmers and fishermen have affected and been affected by the area.

The recent increase and variety of recreational pressures has necessitated greater attention being given to the protection of the resources of this special place. I am pleased therefore to provide these planning and management policies, which are designed to maintain the area's exceptional natural qualities while continuing to satisfy present and future recreation needs.

This master plan has opted to treat the Charleston Lake area as one "recreation complex" rather than managing the provincial park, recreational areas and Crown lands through separate plans. By treating all the areas and resources presently influenced by recreational activities as one unit, the plan's policies can ensure quality recreation development and comprehensive resource management.

I would like to express my appreciation to the Federal Government, which, through the Department of Agriculture's ARDA program, has provided assistance in the purchase, planning and development of Charleston Lake Provincial Park. This co-operative endeavour has made it possible for visitors to appreciate and enjoy the exciting attributes of such a park. In addition, the input provided by individuals or groups to the plan through discussion, briefs and questionnaire responses is gratefully acknowledged. I look forward to continued public interest in the implementation of this plan and in the planning of other provincial parks throughout Ontario.

The Charleston Lake master plan, as approved by me in accordance with The Provincial Parks Act, Sections 1d and 7a, is the official policy for the conservation, development and management of the area. I am confident that the implementation of the plan will make the recreational opportunities compatible with the resource values identified for this area.

Hon. Frank S. Miller
Minister
March, 1978

Contents

Figures

Tables

Metric Measures

Unit	Equivalent
centimetre (cm)	0.3937 inches
metre (m)	3.2808 feet
kilometre (km)	0.6214 miles
square kilometre (sq km)	0.3861 square miles; 100 ha
hectare (ha)	2.4710 acres
cubic metre (cu m)	35.3148 cubic feet
kilogram (kg)	2.2046 pounds
kilowatt (kw)	1.3410 horsepower
degrees Celsius (°C)	°C × $\frac{9}{5}$ + 32 = degrees Fahrenheit (°F)

Introduction

Charleston Lake is situated in Eastern Ontario in the centre of Leeds County between the well-travelled Rideau Waterway to the north and the busy Macdonald-Cartier Freeway and St. Lawrence River Corridor to the south.

This part of Eastern Ontario is a southern extension of the Canadian Shield, known as the Frontenac Axis. Its rugged, northern-like landscape has influenced both the natural and human history of the area, affecting its inhabitants in different ways and at different times. In earliest times, nomadic hunting bands visited the area on summer hunts. When settlers came to this part of Upper Canada, they found the Charleston Lake area rough and unproductive. The fragility or absence of soil, the sensitivity of the vegetation, the roughness of the terrain and the poor drainage all made farming difficult. Although these features of the Shield place severe limitations on development and productivity, they do, however, provide an attractive base for many recreational activities.

The landscape around Charleston Lake has always been much better suited to outdoor recreation. In the 1860s, this area was a retreat for the well-to-do members of the leisure class. People came from Ottawa, Toronto and upper New York State. Steam and sailing vessels plied Charleston Lake's waters, and the fishing was excellent. This was a place to relax and escape the pressures of that era.

Modern recreationists have different life styles and better equipment, but they come for the same reasons — a view of the lake, a relaxed atmosphere, uncrowded conditions and excellent fishing.

The Master Plan Process

The master planning program for the Charleston Lake area was initiated in the fall of 1973. The background studies for the planning process involved identifying resource features, determining the public's views and demands on recreation in the area and determining user and resource relationships. Using the information gathered through these studies, the master plan relates the anticipated recreational needs of the people to the principles of proper resource management and land use planning. Then, by formulating the park goal and the objectives which will ensure the attainment of the goal, broad strategies can be prepared which will ensure the proper development, management and use of the existing park area and proposed additions.

To determine the public's views of the area and recreational demands, a public participation program was undertaken. This included the distribution of questionnaires to park users and local interest groups, informal meetings with organizations, displays in public places and in the park, information packages and news releases. The information assembled through the responses to the program provided valuable input into the plan.

It is necessary to clarify at this point that the area under study referred to in the master plan as the planning area includes the existing Charleston Lake Provincial Park, the Blue Mountain area, which includes private and Crown land, as well as the Crown islands in Charleston Lake. These areas are treated as one entity because they are presently utilized as one by visitors to the area. The master plan supports the recommendation that those areas presently not under regulation should come under regulation in the future and be designated as Charleston Lake Provincial Park. Therefore, the policy in the *Charleston Lake Provincial Park Master Plan* will regulate the development of the existing park area and the future park area.

Regional Context

Charleston Lake is in the Eastern Region of the Ministry of Natural Resources and is managed by the Brockville District Office. It lies 48 km northeast of Kingston, 96 km southwest of Ottawa and 56 km north of Watertown, New York. It is accessible by County Road 3 from Highway 42 and Highway 15 and the Lansdowne turnoff from Highway 401 and Highway 2 (Figure 1).

The area within a 160-km radius of the park is considered the primary market area. It includes such centres as Ottawa, Kingston, Cornwall, Brockville, Belleville, Trenton and Smith Falls, each with a population exceeding 10,000. Several smaller centres, such as Prescott, Athens, Gananoque, Maitland, Kemptville, Perth, Napanee and Picton, could also provide a significant number of users. These population centres serve as the immediate market area and have already placed demands for recreational expansion on the region's parks. The total market area population is given in Table 1. Table 2 summarizes the urban population of the market area.

Recreational Trends

Trends in recreation preference and participation have been the subject of several recent surveys. Before considering the development of Charleston Lake Provincial Park for outdoor recreation, it is important to review the present trends for dispersed, resource-based activities. It will be seen that the park's potential to accommodate these types of activities is quite significant, and reviewing these trends confirms the need to provide them wherever possible. The data following, in Table 3 and Table 4, is from the Tourism and Outdoor Recreation Planning Study (TORPS) and the Canadian Outdoor Recreation Demand Study (CORDS).

Participation in physically demanding activities decreases rapidly with increasing age (i.e., swimming). All selected activities show higher participation rates for males than females. Participation in hiking increases rapidly with increasing education but less rapidly with increasing income.

In general, young people, males, those difficult to contact and people with high income and high education levels participate in a much greater total number of activities.

Regional Facilities

Within the context of a regional recreation system, Charleston Lake Provincial Park has the potential to play a significant role. There are approximately forty recreation establishments totalling less than 2,400 ha within 40 km of this park. They are managed primarily by private operations. Other establishments are operated publicly by the local municipality or by the St. Lawrence Parks Commission. In addition to providing over 2,000 campsites, these facilities have some recreational opportunities for swimming and picnicking.

The contribution which Charleston Lake Provincial Park will make to the regional recreation program is dependent on the potential development of the resources and the type of user attracted. Recreational trends show that park development should be directed towards dispersed activities, both extended and day-use, for destination users. Any development, however, should be in sympathy with regional resource capabilities.

The extent and the character of the area's resources and capabilities gives Charleston Lake Provincial Park significance within the context of the regional provincial park system. Located nearby are Frontenac Provincial Park, about 42 km to the west, and Murphys Point Provincial Park, 42 km to the north, each with its own unique character. When considered together, these parks can highlight each other's resources and the region's tremendous potential for a variety of activities. The capability of each area for dispersed recreational activities suggests complementary park programs emphasizing the features exclusive to each park.

Table 1: Total Market Area Population

	Within 40 km		*Within 80 km*		*Within 160 km*	
Area	*Population*	*Percent*	*Population*	*Percent*	*Population*	*Percent*
Ontario	50,093	100	246,719	55	1,119,078	55
Quebec					217,038	10
New York			200,499	45	714,355	35
	50,093	100	447,218	100	2,050,471	100

Regional Context

Provincial park

District boundary

Region boundary

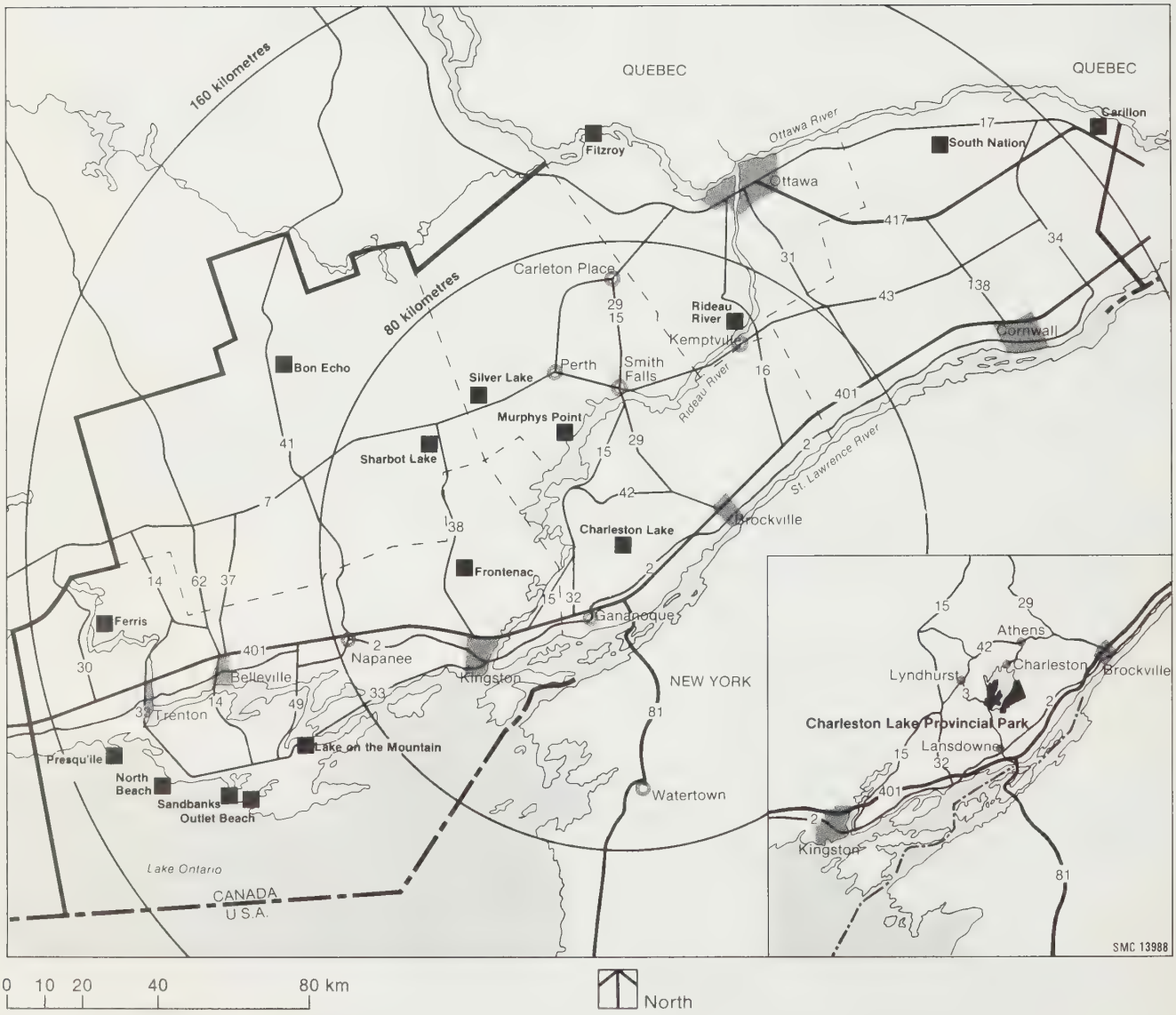


Table 2: Urban Population (cities of 20,000 or more)

Area; City	*Within 40 km Population*	*Percent*	*Within 80 km Population*	*Percent*	*Within 160 km Population*	*Percent*
Ontario:						
Brockville	19,765	100	19,765	18	19,765	2
Kingston			59,047	53	59,047	6
Belleville					35,128	4
Cornwall					47,116	5
Ottawa					302,341	37
Vanier					22,477	3
Sub-total	19,765	100	78,812	71	485,874	57
Quebec:						
Gatineau					22,321	3
Hull					63,580	7
Sub-total					85,901	10
New York:						
Rome					50,148	6
Syracuse					197,208	23
Watertown			30,787	29	30,787	4
Sub-total			30,787	29	278,143	33
Total	19,765	100	109,599	100	849,918	100

Table 3: Participation in the Top 25 Recreational Activities (at least once over a 12-month period)

Activity	*Percentage of Participation*
Recreational driving	63.4
Swimming	62.1
Picnicking	56.8
Attending annually scheduled fair or other special event	51.7
Attending a spectator sport	50.4
Recreational walking	49.1
Visiting recreation home	43.8
Fishing	38.3
Attending live theatre or concert	37.8
Visiting a museum or art gallery	33.3
Visiting botanical garden	33.2
Motor-boating	32.8
Visiting a developed historic site or display	32.6
Ice skating	29.3
Visiting other nature displays	28.9
Camping	28.3
Recreational bicycling	27.8
Hiking	20.8
Recreational snowmobiling	19.8
Tobogganning or sledding	19.7
Baseball, softball	18.0
Alley bowling	16.0
Canoeing	15.1
View or photograph birds, animals or fish	13.2
Golfing	13.1

Source: TORPS, 1975.

Table 4: Participation in Selected Outdoor Recreational Activities by Ontario Residents

Activities	*1967 Percentage*	*1969 Percentage*	*1972 Percentage*
Swimming	47	53	
Tent-camping	13	10	19
Trailer-camping	6	4	10
Pick-up camper		1	2
Hunting	12	10	8
Power boating	19	23	23
Canoeing	8	10	11
Sailing		4	6
Other types of boating	9		
Water skiing	9	9	
Nature study or bird watching	13	13	
Scenic viewing	42		
Outdoor photography	20	21	
Visiting historic sites/parks	18	40	39
Visiting other parks		48	
Driving for pleasure		63	63
Sightseeing from private vehicle		54	45
Visiting new places	34		
Climbing	4	5	
Downhill skiing	6	9	6
Snowmobiling	6	10	17
Snow sledding/tobogganning		17	
Picnics/cookouts away from home	44	56	56
Walking/hiking	11	39	38
Golfing		12	
Ice skating		23	24
Horse back riding		8	8
Bicycling		13	20
Tennis		7	
Fishing	29		30
Relax and get away from it all	49		
Cross-country skiing		2	4

Note: Blanks indicate that no data is available.
Source: CORDS Technical Note No. 22, 1973.

Charleston Lake Planning Area

In the spring of 1962, Professor A.J.E. Child, a member and strong supporter of the Federation of Ontario Naturalists, offered to sell his property on Charleston Lake to establish a provincial wilderness recreation area. His property consisted of a peninsula on the west shore of the lake between Slack Bay and Runnings Bay. It featured about 5 km of rocky, picturesque shoreline. During the summer, the then Department of Lands and Forests (now the Ministry of Natural Resources) surveyed the Child property and subsequently submitted a proposal to the Ontario Parks Integration Board recommending the establishment of a park on Charleston Lake. The proposal was approved by the Board in 1964, and negotiations were initiated to acquire the properties needed for a park.

The park was at this time included in an ARDA agreement between the provincial and federal governments. ARDA, the Agricultural Rehabilitation and Development Administration, is a cost-sharing program designed to assist rural development by means of farm adjustment, rehabilitation and rural resource development. Its goal is to improve the economic base and to provide local employment opportunities. Land acquisition and development of facilities have been expedited by this program. The agreement between the two agencies expired in 1975-76.

Between 1968 and 1970, design plans for Charleston Lake Provincial Park were prepared. Development was initiated in 1970-1971. During the preliminary phases, it became apparent that the planning exercise should focus on a broader land base in the Charleston Lake area. The planning has since expanded to consider the area on two sides of the lake rather than just the provincial park as the area requiring a master plan (Figure 2).

There was a choice in the direction which could be taken for developing the park's plan. The plan could have followed either the "static approach" or the "dynamic approach". According to the static approach, each area is considered as an individual, autonomous unit and the resources and activities are developed separately. The areas would be developed to attract a separate or duplicate portion of the recreation market and development or programming would not necessarily be related. Therefore, the user and his experience would be fixed primarily to a single area, thus providing little opportunity or incentive for a visitor actively to explore and to relate to the uniqueness and variety of the environment.

The dynamic approach views the area on a broader perspective and relates the recreational potential to an area plan. It satisfactorily recognizes the interrelated character of the landscape and the recreational experiences. By adopting the dynamic approach for the master plan, the park and recreational development of the existing Charleston Lake Provincial Park and the Blue Mountain area would integrate the physical and cultural resources so as to retain a high-quality natural environment, accentuating and interpreting the unique landscape and satisfying a variety of recreational needs and interests. By means of the dynamic concept, the visitor would be stimulated to explore, discover and enjoy the area's biological, cultural, geological and aesthetic features which give Charleston Lake its unusual character.

The following is an explanation of the development and facilities of the various segments which compose the Charleston Lake planning area.

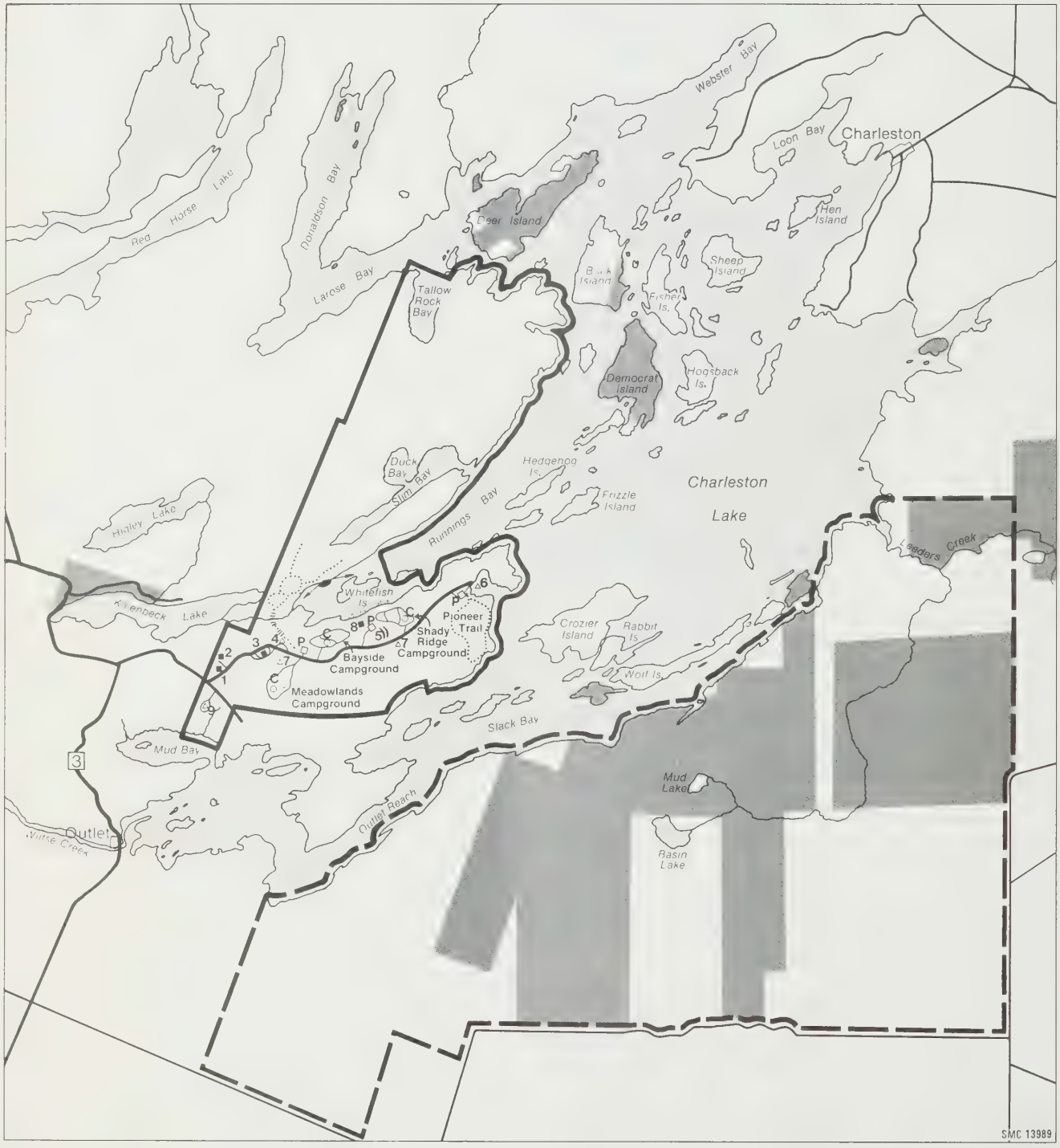
Existing Park

The existing provincial park of 903 ha is located on the east side of the main body of Charleston Lake. Development commenced in 1968, and much of the proposed development has been completed to date (Figure 2). Charleston Lake Provincial Park presently has the following facilities:

Auto campsites	227
Boat-in/hike-in campsites	24
Day-use parking spaces	80
Gravel roads (one-way)	4.4 km
Prime roads (two-way)	3.2 km
Drainage ditch	2 km
Active recreation area	162 ha
Passive recreation area	526 ha
Docks	30 sq m
Gabions	24 cu m
Boat ramps	1
Fencing	1524 m
Hiking trails	10.4 km
Cross-country skiing trails	8 km
Snowmobile trails	80 km
Trailer sanitary station	1
Hydro, primary (buried)	1012 m
Water system	1
Beaches	243 m
Office, Type 4	1
Comfort station, Type 8	1
Comfort station, Type 0	3
Vault privies	16
Outdoor theatre	1
Change house	4
Pump house	1
Maintenance building, heated	1
Maintenance building, unheated	1
Boat house	1

Charleston Lake Planning Area

- Crown land and islands
- Existing park boundary
- Blue Mountain Area boundary
- 1 Park office
- 2 Maintenance area
- 3 Park gate
- 4 Trailer sanitation station
- 5 Amphitheatre
- 6 Boat launching
- 7 Firewood
- 8 Pump house
- 9 Group campground
- C Comfort station
- P Parking
- Boardwalk
- Trail
- Beach
- Vista



Visitor statistics have been prepared from the summer seasons and are given in Table 5.

Table 5: Park Visitor Statistics

	1972	*1973*	*1974*	*1975*
Total visitation (hose count)	3,049	44,320	59,175	69,066
Day-use visitation (permit sales)	413	4,221	5,303	6,895
Campers	1,467	6,004	6,064	9,612
Camper-days	2,462	10,592	19,336	28,947
Camper-days per campsite	24	69	125	152
Average length of stay (days)	1.7	1.8	3.2	3.0
July/August occupancy (percent)		28	40	49

It is interesting to note that the average length of stay increased rapidly to about three days, which is higher than the provincial average and indicative of the wide variety of recreational activities available for visitors. Campsite permits for 1974 were analysed to determine the origins of people using the park. A breakdown is shown in Table 6.

Table 6: Camper Origins (from 1974 permits)

Urban (Ontario)	
Within 40 km	21.3%
Within 80 km	41.9%
Within 160 km	58.5%
Within 240 km	58.6%
Within 320+ km	74.8%
Other	
Rural Ontario	0.9%
Quebec	9.9%
Other provinces	0.1%
U.S.A.	14.2%
Other countries	0.1%

Crown Islands

In Charleston Lake, there are some eleven Crown islands or parts of islands of 0.4 ha or more in size. There are also many smaller rocks and reefs vested in the Crown. Together these islands total approximately 144 ha.

A problem associated with these islands is the lack of clear property titles. In some instances, private individuals claim title to some of the islands which are thought to belong to the Crown. The Brockville Office is attempting to clear up these controversies so that a definite management plan for the islands can be written and implemented.

Blue Mountain Area

This large area of approximately 2,765 ha, shown on Figure 2, contains public and private lands. Less than half of the properties are Crown-owned. Acquisition of the remaining properties should proceed as quickly as possible. This area has many significant natural features which need protection through a proper management plan.

In addition, there are a number of cottages along the shoreline of Charleston Lake which are not recommended for acquisition but which could be included should they be offered for sale to the Ministry.

Other Crown Lands

There are approximately 1,214 ha of Crown land lying to the east, outside the boundaries of the park and the Blue Mountain area. These lands are primarily forest lands, but have recreational potential for trails and hunting. They are not included in the planning area or the zoning concept for management. However, it is recommended that they be included in any activity programs which affect the areas.

Biophysical Resources

Climate

The nearest data stations of the Canada Department of Environment are at Kingston and Brockville. Table 7 gives the interpolations of the data from these stations. However, elevation, abrupt topography, vegetation and the proximity of small water bodies all affect the local climatic conditions of the Charleston Lake area. Therefore, the climatic conditions given below are only representative when allowance is made for the aforementioned considerations.

Table 7: General Climatic Conditions

	Mean Daily Temperatures °C	*Accumulated Rainfall cm*	*Accumulated Snowfall cm*
January	— 8	2.41	55.9
February	— 7	2.54	44.4
March	— 1	3.94	29.2
April	6	6.86	5.1
May	13	8.00	trace
June	18	6.86	—
July	21	7.49	—
August	20	8.51	—
September	16	8.00	trace
October	10	7.49	1.5
November	3	7.62	15.2
December	— 5	4.06	45.7
Annual	7	73.79	196.8

Geology and Geomorphology

The Charleston Lake planning area is situated on the Frontenac Axis, an extension of the Precambrian Shield, which extends into the Adirondacks in New York State and divides the Great Lakes-St. Lawrence Lowlands (Figure 3). Rocks within the park represent two major geological time periods. Separated in age by millions of years, the rocks of the Precambrian and the Paleozoic periods are found in contact within the park (Figure 4).

Situated as it is on the Frontenac Axis, which is part of the Grenville Structural Province, the park contains characteristic intrusive granites and metamorphic gneisses which are highly deformed. In dramatic contrast to these old twisted rocks are the relatively younger sandstones and conglomerates of the Nepean Formation of the Paleozoic period. These sedimentary rocks lie unconformably atop portions of the shield in the park area.

The topography here is typical of the Precambrian Shield because of the folding and refolding, intruding of fluids, metamorphism and differential erosion of the rocks. Sediments which were deposited over one billion years ago were deformed and contorted by intense heat and pressure during metamorphism. Limestones became crystalline limestones or marbles, sandstones became quartzites and shales became biotite gneisses. Since the original sediments were not pure, their metamorphic equivalents are not pure, and their compositions grade into one another and are interlayered. Fluids were injected during metamorphism to form still additional layers of a different composition as well as bodies of igneous rock such as granite, syenite and diabase.

Folding which resulted from metamorphism is best expressed by the rocks in the western portion of the park. A syncline, or valley of a fold, is shown on the Bedrock Geology map (Figure 4), and the contortions of these layers of rock are easily distinguished even on this small map.

The presence of the highly resistant Precambrian rock of the Frontenac Axis coupled with the less resistant sandstones and conglomerates of the Nepean Formation are more directly responsible for the present surficial geology.

Since crystalline limestone (marble) is softer than granite, it is more easily eroded and accounts for the low-lying areas. Quartzite, as well as granite, is fairly resistant to weathering and so remains as prominent ridges. Paleozoic sediments were deposited over most of this area 500 million years ago, but since that time have been subjected to the forces of erosion. The sandstone forms a mean or table-like structure in a few portions of the park, and it lies unconformably on the folding surface of the Precambrian rocks.

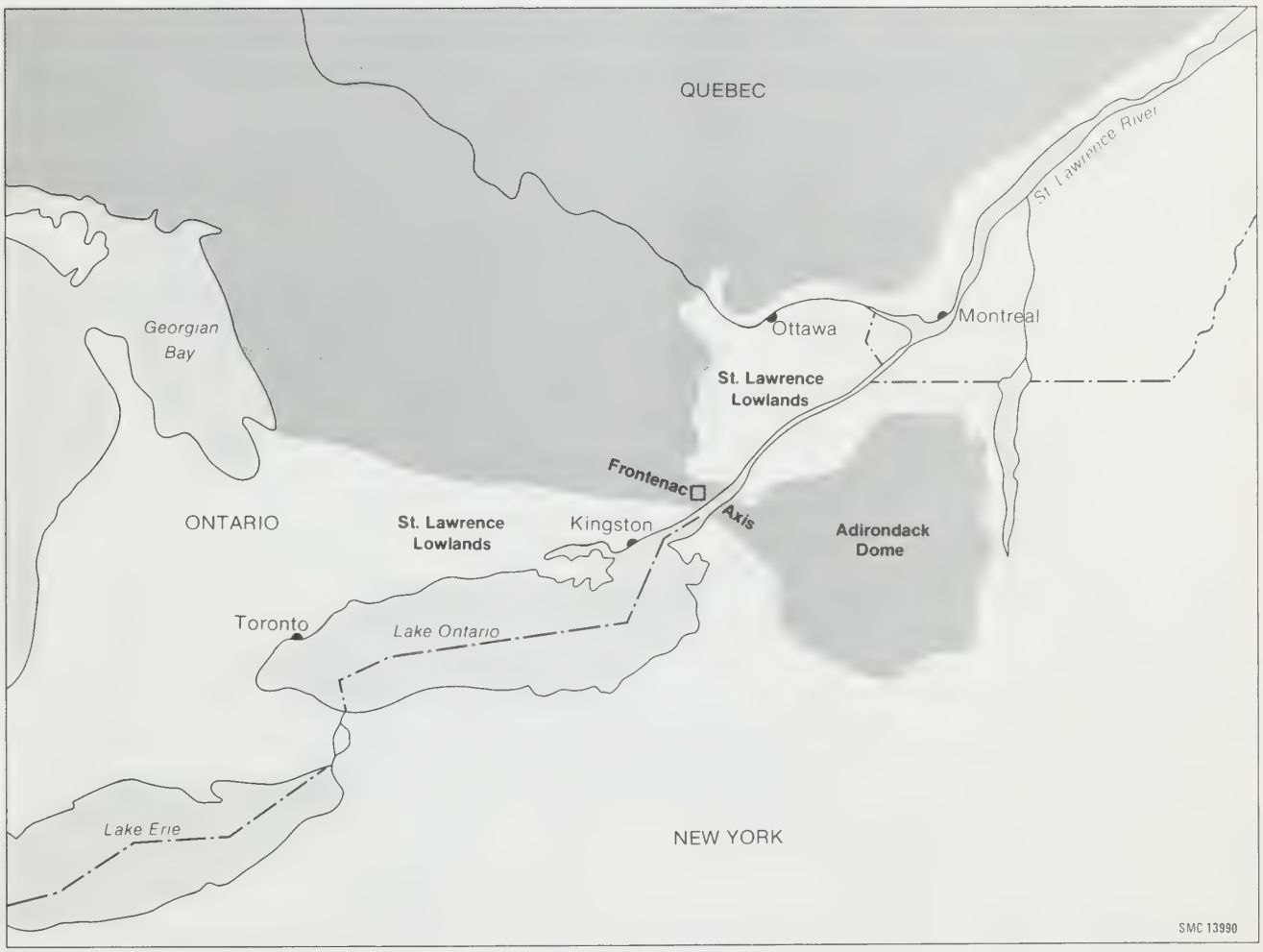
Glacial evidence is present throughout the park. Many outcrops were polished and rounded, gouged and striated. Valleys were broadened, and much of the thin veneer of Paleozoic rocks at the edges of the Shield were removed. Frost action is responsible for the breaking of slabs from outcrops. Water has had some minor effect in sculpting rock faces.

Most deposits are coarse to medium sand with isolated areas of gravel till, fine sand, silt and clay (Figure 5). Lenses of clay are occasionally found within coarse sand. The covering is generally thin with much exposed bedrock. The discontinuous ground moraine is composed of till derived mostly from Precambrian rock.

The Precambrian Shield

Charleston Lake Provincial Park

Canadian Shield



Not to scale

North

Bedrock Geology

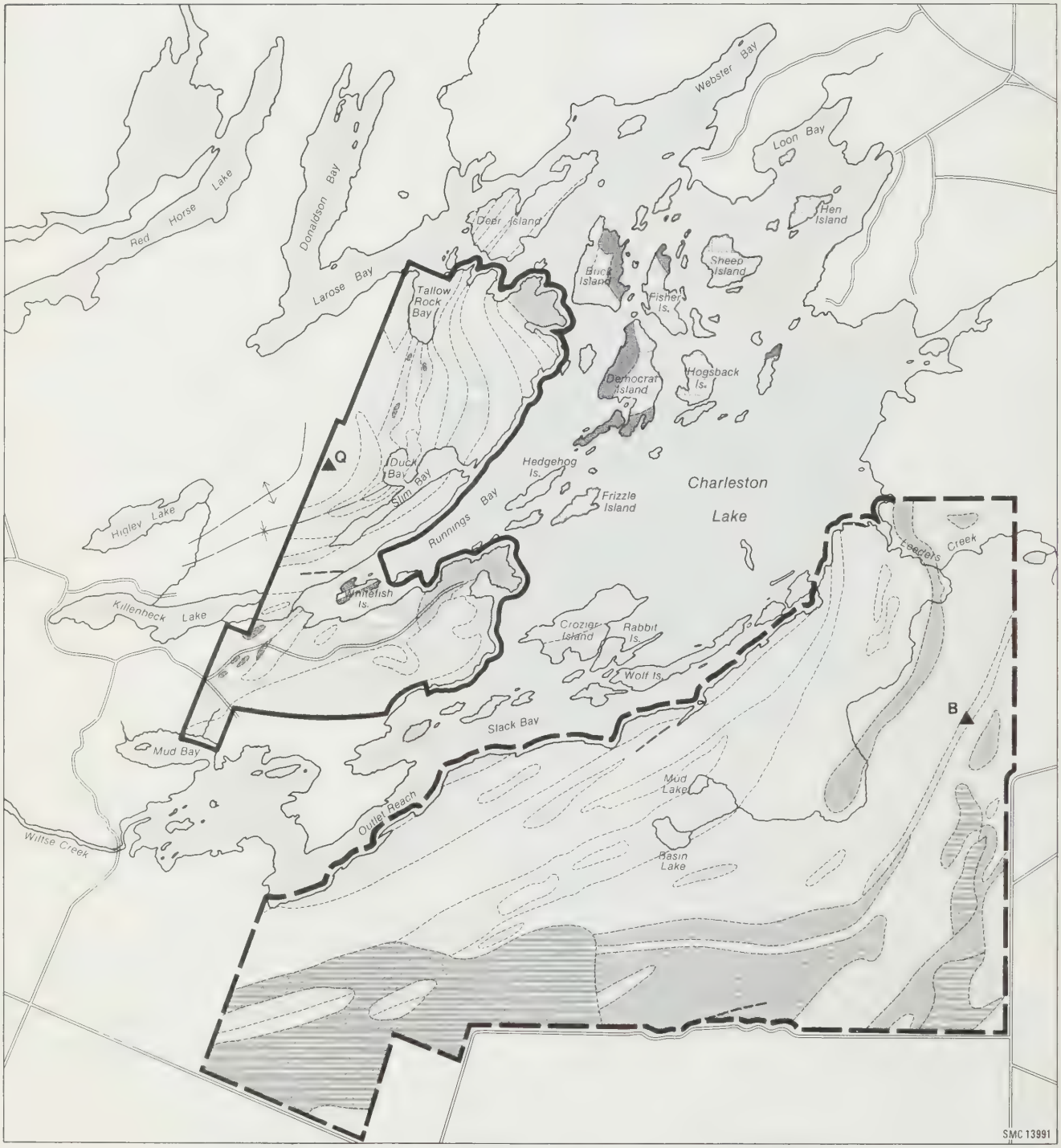
- Existing park boundary
- Blue Mountain Area boundary
- Anticline
- Syncline
- Quartz mine (Q)
- Barite mine (B)

Paleozoic

- Nepean Formation — sandstone and conglomerate

Precambrian

- Diabase dyke
- White pegmatite associated with crystalline limestone
- Syenite, granite
- Granite gneiss, granite pegmatite
- Biotite gneiss, intermixed metamorphic rock
- Biotite-quartz-feldspar gneiss
- Quartzite, quartzo-feldspathic rock
- Crystalline limestone, skarn



0 ½ 1 2 km

North

Surficial Geology

- Existing park boundary
- Blue Mountain Area boundary
- Bare rock
- Sandy till (<0.5m)
- Clay-sand (0.5 — 1.0 m)
- Muck soils/wet areas

On the Precambrian metasediments, depositions are sparse and discontinuous, generally filling depressions between ridges. Till is thicker west of Charleston Lake and thin to the east around Blue Mountain. On the central sandstone plateau, the ground moraine is more continuous and provides for an undulating topography. To the south, deposits become deeper, up to twelve metres, as evidenced by a sand pit excavation. Till spills out over lower lying Precambrian rocks to the southwest of the plateau where the deeper soils occur in the park.

The area is unique in that it lies at the boundary between two ancient water bodies, Lake Iroquois to the southwest and the Champlain Sea to the east. Towards the south, knobs of Precambrian age are surrounded by clay deposited by one of these ancient seas. Local areas of varved clays and stratified deposits were laid down between some of the higher ridges. The most extensive post-glacial deposit occurs at the south end of Runnings Bay. These deposits are formed in bog conditions and are classed as mucks.

Topography

Located as it is on the Frontenac Axis, the Charleston Lake planning area has inherited the rugged character of the Shield. Extremely steep, rocky slopes follow the shoreline of Charleston Lake, restricting beach development (Figure 6). Ideally, a beach resource has three components: a wet beach, a dry beach and a backshore. In relatively few places are all of these components present in adequate amounts to withstand intensive beach development or support a high concentration of users.

Inland the terrain is equally rugged. On the eastern shore of Charleston Lake, there is a series of ridges running northeast to southwest to Blue Mountain at an elevation of 194 m above sea level. Farther south, these ridges gradually flatten out into marginal farmlands.

To the northwest of Runnings Bay, the landscape is similar but less rugged. Ridges tend to run from the northeast to the southwest, but they swing gradually to a northwest and southeast direction as one moves northward.

In contrast to the surrounding harsh terrain, the peninsula between Slack Bay and Runnings Bay is primarily a flat-lying sandstone plateau which turns into gently rolling hills in the south.

The topography of the islands varies little from that of the mainland. Larger islands, such as Deer Island, do have a greater variation in relief than the smaller islands; and they are generally as rugged as the Blue Mountain area.

Drainage

Drainage throughout the area is generally poor. This is due to thin soils and a ridge system which impedes the development of a stream network. Valleys between ridges are generally wet and many areas have no drainage channel.

There are many lakes in the area, all of which are part of the Gananoque River watershed, except for a seasonal flow from the southeast part of the planning area directly to the St. Lawrence River via Jones Creek. The drainage pattern is schematically drawn in Figure 7.

Soils

The Ontario Soils Survey defines over 95 percent of the planning area as rock ("rock" includes areas with less than 0.3 m of soil cover). The many abandoned farms attest to its limited use for agriculture. Farm income is derived mainly from forestry or marginal pasture.

Some soil types have been mapped along the southern boundary of the planning area. Northwest of Junetown is a pocket of Matilda loam, characterized by imperfect drainage and rocky conditions. Farther west are small pockets of Napanee clay, rock-free but poorly-drained. To the south of Charleston Lake planning area, this clay covers all but the tops of Precambrian rock ridges and forms the physiographic region known as the knobs and flats. The terrain occupied by this rich and productive soil is gently sloping, a sharp contrast to the rugged landscape of the planning area.

An organic soil is found at the southern end of Runnings Bay. It is stone-free and rich but extremely wet.

Vegetation

About the vegetation in the Kingston area in particular, the late R.E. Beschel (1965) once stated: "Nowhere in Canada outside of mountains does the overall pattern of vegetation and flora change so intensively over so short distances. Between the shore of Lake Ontario and some 20 miles within the Precambrian Shield, over a distance of about 40 miles, more than 70 flowering plants reach their northern or northwestern limit of distribution. The most intensive changes, however, do not occur — as is often supposed — along the contact line of limestone and Precambrian, but in two zones of higher turnover, one some ten miles from the shore of Lake Ontario and the St. Lawrence, the other some 10 to 20 miles within the Precambrian."

This vegetation phenomena is referred to as the transition zone. In general, the concept refers to the ambiguous belt of vegetation that lies between the great coniferous forests of the north and the more dominantly deciduous stands of the eastern United States. Further, it is commonly believed that there is a correspondence between forest types and the major kinds of land base, so that the coniferous forests are identified with the Shield environment and the deciduous forests are identified with the deeper soils of the St. Lawrence Lowlands. However, the northern limit of many deciduous species varies greatly.

Any easy scheme of "transition" in Ontario is further complicated by the intrusion into Southern Ontario of that narrow band of Shield known as the Frontenac Axis. The Axis and the diverse land bases which are contiguous to it, east and west, have made it an area of considerable interest to naturalists who have identified, for their purposes, a study zone bounded by Trenton, Brockville, Oswego, New York and Smiths Falls.

Such a compact area of vegetation varieties has been termed a "tension zone" in comparison with the normal "transition zone", which is a much wider belt. Charleston Lake, located within this "tension zone", may be the most appropriate area for further study and for the interpretation of the "transition" idea.

Topography

Existing park boundary

Blue Mountain Area boundary

Contour lines (50-foot intervals)

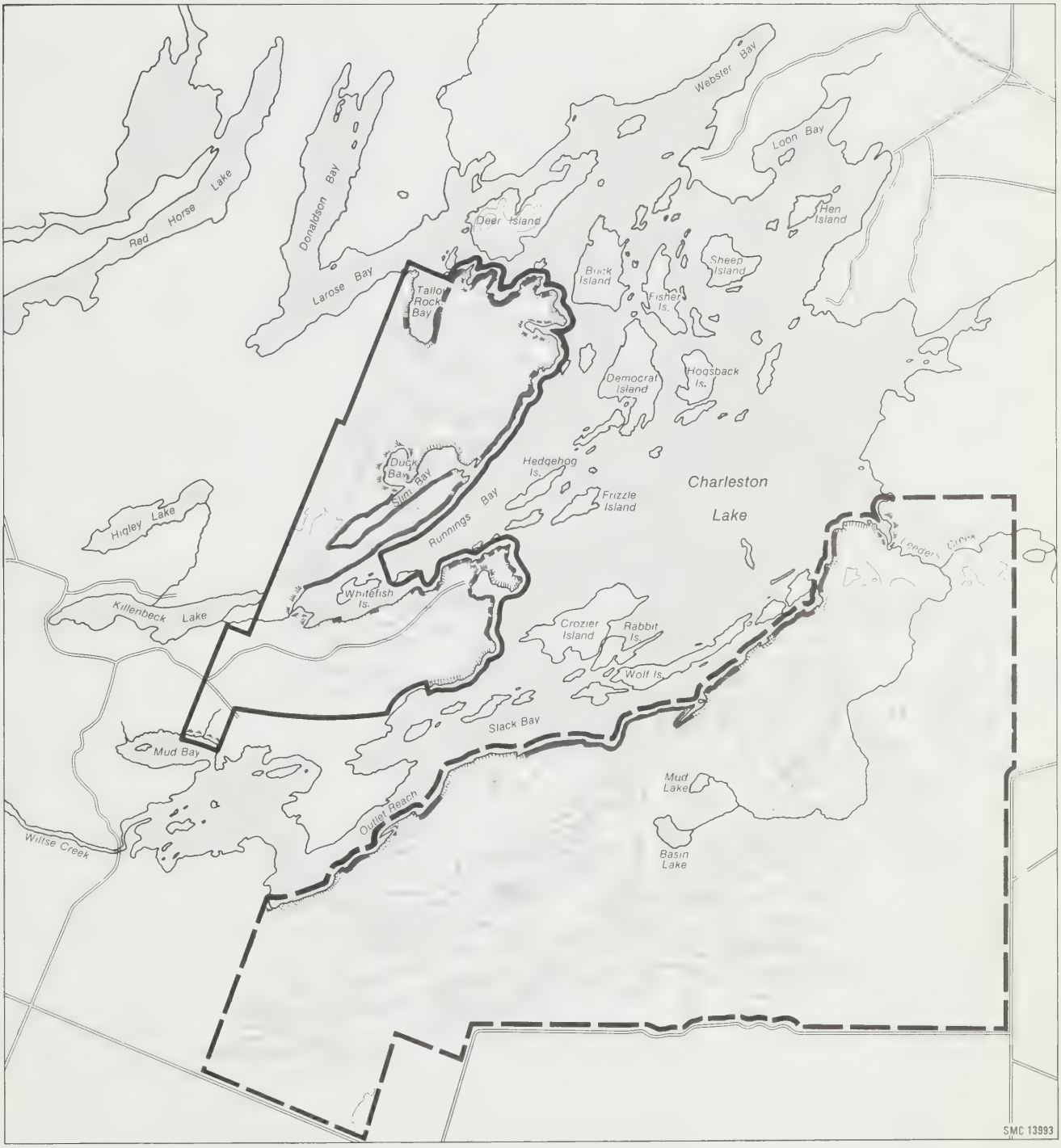
Shoreline Conditions

Steep slope

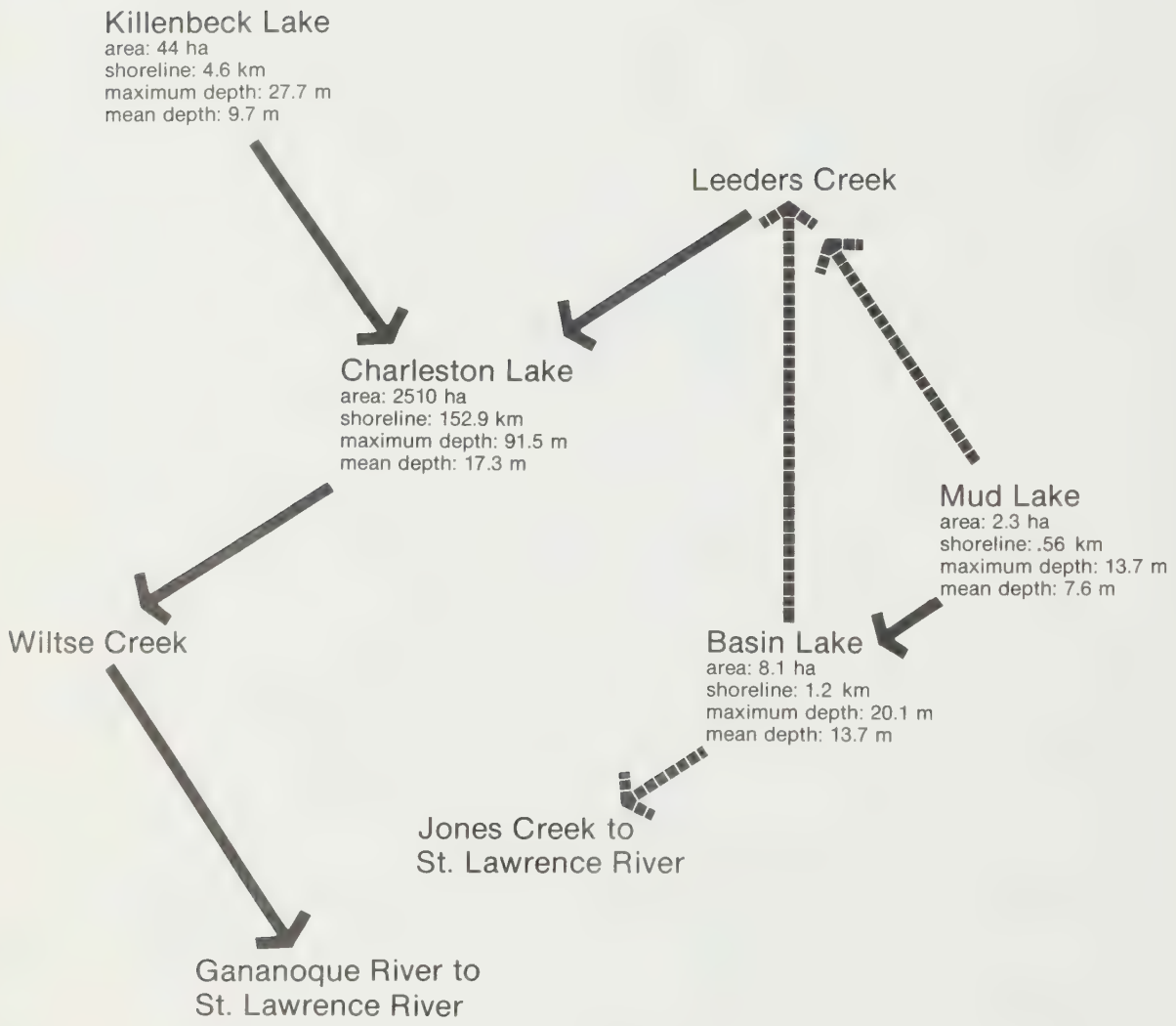
Medium slope

Gentle slope

Marsh



Drainage Year-round Seasonal



Throughout the planning area, sharp contrasts in forest types are encountered when moving from the upland ridges to the many poorly-drained troughs (Figure 8). The wide linear system of ridges which run along the east shore of Charleston Lake, including Blue Mountain, are dominated by a white pine forest. Inaccessibility partially explains the survival of these stands, although nature has now set the stage for the replacement of the white pine as the dominant tree. Tolerant hardwoods make up much of the understory, and pine seedlings are becoming fewer. This pine forest will naturally be succeeded by a deciduous forest in which species such as red and white oak, maple, beech and shagbark hickory will be dominant.

The forest cover west of Slack Bay and beyond the park boundary is composed chiefly of mixed hardwoods with the sugar maple visibly dominant. While once similar to the forests to the east, the presence of slightly deeper soils, better moisture characteristics and easy access led to the harvesting of the pine and hence to a more rapid succession to tolerant hardwoods. Ironwood makes up much of the understory in this area, encouraged by the popular practice of pasturing cattle in the woodlands. Where grazing has been eliminated, sugar maple seedlings tend to dominate.

The eastern and western portions of the planning area are both marked by the signs of disturbance. Fire, logging and the clearing of land have caused the re-appearance of small patches of white birch, large-tooth aspen and trembling aspen. Beech, previously a source of firewood, is now rarely seen. Maple, on the other hand, preserved for the extraction of maple sugar, is abundant. Local pockets of rich soil have led to lush growth, and in these areas, ash, basswood and yellow birch may be found. Other associated species are butternut, hickory, shagbark hickory and hemlock, while lesser components, especially on the ridges, are juniper, red cedar, blueberries and various grasses.

Some of the ridges between Slack Bay and Runnings Bay are dominated by hemlock. Virtually no other tree species or ground cover is found beneath these hemlock stands. Much of this same peninsula, defined by an undulating sandstone plateau, has been cleared and only now is returning to a mixed forest cover. It is presently open parkland, characterized by scattered juniper, shagbark hickory, red oak, white oak, white elm, hard maples and white pine. In addition, raspberries, apple trees, red pine, Scots pine and jack pine are common, and blueberries and poison ivy are prevalent.

The southern portion of the Runnings Bay peninsula and the area surrounding the Blue Mountain ridge are areas of abandoned pasture. Various stages of regeneration are represented in these areas. Buttercup, grasses, yarrow, hawkweed, juniper, apple trees, pussytoes, heal-all, clover and daisies are common. The terrain is less rugged, and deeper soil conditions prevail. Soft maple swamps and areas with a high water table tend to be choked with willow, a wide variety of ferns, spirea, alder and dogwood.

Trilliums, Canada mayflower, false Solomon's seal, white and red baneberry and round-leaved hepatica are examples of species found on the deciduous forest floor. Unusually large numbers of long-bracted orchis are also found.

The flora found on the islands of the park varies little from that of the mainland. Variation is greater on the larger islands, such as Deer Island, where a wider range of topography exists.

A list of identified flora was prepared for the background studies and is available from the park office. While the forest cover at Charleston Lake is reasonably well-documented, information on smaller vegetational forms is still scanty. Therefore, this park may be an appropriate area for additional vegetation studies.

Fauna

The same diverse physical characteristics which influence the wide range in vegetation communities and species also result in a wide range of mammals, birds, fish, insects and reptiles. Species checklists were prepared for the background studies and are available from the park office. Although checklists have been made and some sightings recorded, more work still has to be done in this area.

Mammals
Populations of various mammals range from high to low, with some species, recorded earlier, no longer indigenous. Some of the species commonly identified in 1891 by Reverend C.J. Young are black bears, coyote, porcupine, whitetail deer and occasional sightings of lynx. Today, mammals common to this area include mink, squirrel, beaver and varieties of hare.

Birds
The various habitats which occur in this area, as a result of the transition zone and the unique vegetation, have become home to a very extensive array of birds. Preserving these habitats, as dealt with in the Special Features and Sensitive Areas section, will promote the survival of these species.

Fish
Charleston Lake is a very deep, oligotrophic lake and supports the best known lake trout fishery in Leeds County. A checklist of recorded species can be found in the background information documents. The lake is stocked annually under a lake management program.

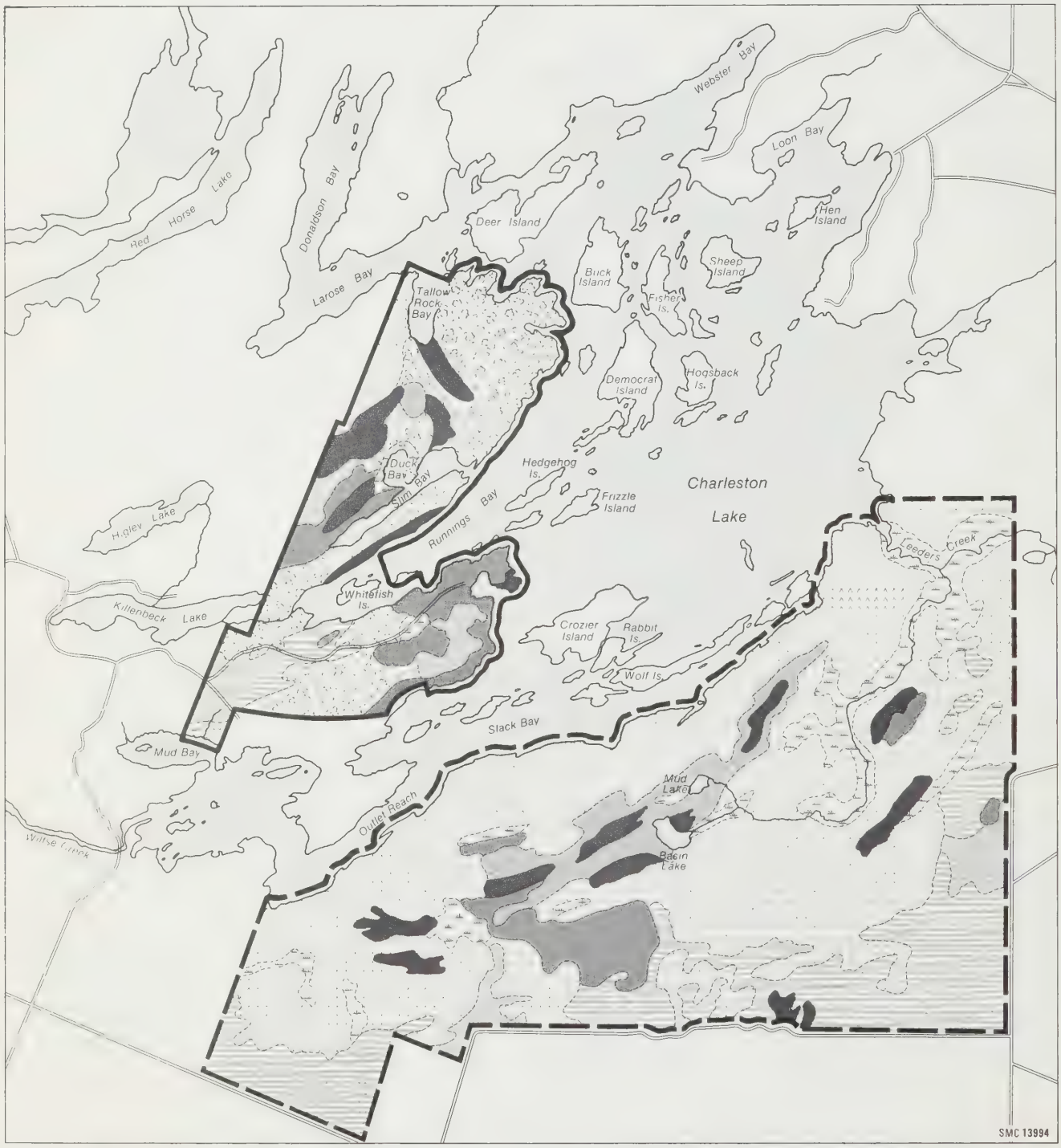
Mud Lake, Killenbeck Lake and Basin Lake are also under management programs. Prior to 1967, Charleston Lake was also stocked with largemouth and smallmouth bass. Other species present in the lake include largemouth and smallmouth bass, northern pike, whitefish, alewife, lake herring, white sucker, golden shiner, yellow bullhead, brown bullhead, American eel, ling, rock bass, pumpkinseed, bluegill, black crappie and yellow perch.

Mud Lake and Basin Lake are managed for brook trout on a put-and-take basis. No natural reproduction occurs. Year-old lake trout are planted in Charleston Lake to augment natural reproduction.

Present winter angling success for lake trout is four times the rate of summer angling success. However, the variety of fish found in the lakes of the park provides for year-round fishing opportunities. Apart from fishing, the lakes and bays are very scenic and afford many good vistas.

Vegetation Cover

- Existing park boundary
- Blue Mountain Area boundary
- White pine
- Pitch pine
- Maple
- Mixed forest stand
- Semi-open brush and hardwood
- Open grassland
- Swamp
- Bare rock



0 1 2 km

North

Insects
The invertebrates of the Charleston Lake area have received very little attention. Visitors, however, are quite aware of the presence of mosquitoes, black flies, deer flies and "bulldogs" throughout the summer because of their taste for human blood. The webworm and tent caterpillar are noticeable because of their defoliating habits.

It is assumed that species and microclimatic variations will permit a good cross-section of typical Eastern Ontario invertebrates; however, further study is necessary to achieve a proper understanding and to prepare a suitable checklist.

Reptiles
A list of reptiles and amphibians common to the Charleston Lake planning area can be found in the background studies available from the park office. The black rat snake has been identified as a threatened species, and measures which should be taken to ensure its preservation are discussed in the Special Features and Sensitive Areas section.

Cultural Resources

The principal cultural resources of the existing park are archaeological sites dating back to the historic era, i.e., the post 1860 European settlement, and to the prehistoric era (Figure 9). These discoveries have made the Charleston Lake area a popular spot for archaeological investigations. The evidence of prehistoric sites is most significant in terms of the physical remains themselves and also in terms of what they reveal about Ontario's history. More than twenty small campsites have been located at the heads of shallow bays and on peninsulas in or around the area. These prehistoric campsites are believed to have been used on a seasonal basis by small nomadic native hunting bands which cruised the waters of Charleston Lake on summer hunts for over 3,000 years. No prehistoric buildings or village sites of unique proportions remain in the park, which leads historians to believe that Charleston Lake was only used as a resource area for summer hunts.

There are three other sites of particular interest. They are the Jackson's Point and Gordon rock shelters and the Slim Bay pictographs. Jackson's Point and Gordon rock shelters are openings in the rock face; the smaller openings were used by animals and the larger ones were used by primitive man. As well as being noteworthy cultural features, they are important earth science features. They occur at the interface of Precambrian and Paleozoic rock where Nepean sandstone and conglomerates (weakly cemented mixture of quartzite pebbles) come together. The cavity results when the weaker layers of conglomerate crumble beneath the more resistant sandstone.

The Slim Bay pictographs are mysterious symbols and designs painted on stone, believed to be messages from early man. These pictographs are usually found on sheer rock faces which rise vertically out of the water. Many questions come to mind concerning this mysterious form of communication. These questions may be answered through further research.

Other sites of general and cultural interest include Slim Bay Gap and Blogget Point. The sites are evidence of miscellaneous and sporadic settlements (i.e., early roads, fences, dumps and early mining activities). Separately, they do not represent an overall important theme.

Generally, the prehistoric sites and associated artifacts offer the opportunity for piecing together an interesting interpretation of prehistoric man, his migration patterns and prehistoric life in Ontario in general.

Several nineteenth century pioneer agricultural landscapes are of particular historic interest as indications of how the rugged conditions of the Frontenac Axis acted as a curb on early settlement around Charleston Lake. There were few, if any, settlers in the immediate area prior to 1820. One loyalist grant was recorded for the year 1816 to Joseph Dennis, but it is not clear if the grant was ever actively worked.

The landscape, although largely unsuitable for agriculture, has supported a number of farmsteads, and farming is still conducted on the margins of the planning area. The greatest agricultural successes were in dairying because of the grasses which grew well on the thin soils. The dairy products were used in the Leeds County cheese industry.

The most characteristic historical activities at Charleston Lake are those associated with nineteenth and twentieth century recreation. As early as 1860, tourists from Ontario cities and New York State began to frequent the area. This historic aspect of Charleston Lake remains as important today as it was in the 1860s.

Cultural Resources

Existing park boundary

Blue Mountain Area boundary

Historic

Settlement feature

Mine

Prehistoric

Rock shelter

Primary Indian campsite

Secondary Indian campsite

Environmental Analysis

Significant features and concepts have been determined on the basis of available background information. Although the resource data available is incomplete, processes and programs need to be identified now in order to safeguard future developments. It is imperative, however, that the work and information be completed as quickly as possible.

Development Potential

After studying the geomorphology, soil and topography data, the information was analysed to determine what type of restrictions these earth science features would place upon activities in the area. The development suitability is indicated in Figure 10.

Special Features and Sensitive Areas

One of the purposes of a master plan is the identification and protection of unique, special and sensitive features. The special features of the Charleston Lake area, some of which are identified in Figure 11, are important, and they impose restrictions on development, activities and the master plan. Other features in need of protection may become known in the course of future work. Provision will be made for incorporating them into the plan to ensure their conservation. Following are some of these significant features.

Showy Orchis
Thirty showy orchis plants are located in a narrow valley extending south from Slim Bay. The site should not be accessible by trail or be a part of the regular park interpretive program. It should be made available only to selected visitors on a personally conducted basis.

Hooker's Orchis
This plant occurs in an isolated location east of Tallow Rock Bay and on Deer Island. Because of its inaccessibility, it is in less danger of being damaged by visitors.

Walking Fern
The walking fern is located on two crystalline limestone blocks in the valley running south from Tallow Rock Bay. The location is well removed from the Tallow Rock Bay Trail and should therefore be relatively safe. In addition to its rarity, this plant has a very interesting reproductive system. The extremely long narrow leaf tips root wherever they contact a suitable substrate, thereby giving the impression of "walking".

Pignut Hickory
This species, well north of its range, has been reported on a ridge south of Blue Mountain. Its existence has not been confirmed; but if located, it should receive the special protection afforded rare species.

Pitch Pine
This particular variety of pine is one of Canada's scarcest species. It occurs in only two locations in Canada, Chateauguay County in Quebec and the Thousand Islands region of which the Charleston Lake area is its most northern range. Pitch pines are scattered along the shoreline of the lake and in significant concentrations on many of the quartzite ridges north of Duck Bay in 18 isolated populations whose numbers are decreasing (Van der Kloet, 1973). Pitch pine, besides its rarity, is important in studies of plant and animal distribution and in studies of the ecological relationships between species and environment. It is also important to geneticists because of its fast-growing, cold-hardiness characteristics.

Wildflower Meadows
Numerous grassy meadows containing black-eyed Susan, white daisy and other colourful wildflowers are outstanding and attractive because of the unusual numbers of flowers. Many park visitors comment on the beauty of these meadows, which should therefore be managed as meadow areas with the specific objectives of maintaining large populations of this colourful flora as a bonus to the visitor experience.

Blue Mountain
This is the highest point in the area, rising 108 m above Charleston Lake. The mountain can be seen while travelling along many of the roads to the west, south and east, as well as from many other vista points. It is a well-known landmark and is therefore the goal of hikers, snowmobilers and explorers. From the top of Blue Mountain, Charleston Lake can be seen spreading out over the landscape to the north. Towards the south, there is a fine panoramic view of farms and forests.

Charleston Lake
With a surface area of 2,520 ha, Charleston Lake is a very deep oligotrophic lake, displaying the more important characteristics of this lake classification, including its sensitivity to the various forms of stress that modern society may produce. Charleston Lake supports the most important of five lake trout sports fisheries and one of two whitefish populations in the Brockville District. Both of these species require an environment associated with oligotrophic lakes, which must be maintained if these populations are to flourish. Any degradation in water quality will reduce the potential of this lake to maintain such desirable species of sports fish and will adversely affect the many other forms of recreation which depend on high water quality. The ideal location of this lake, its attractiveness to recreational users and its sensitivity to their presence all dictate that care must be exercised in the development of Charleston Lake Provincial Park as the single largest development around the lake.

Development Potential

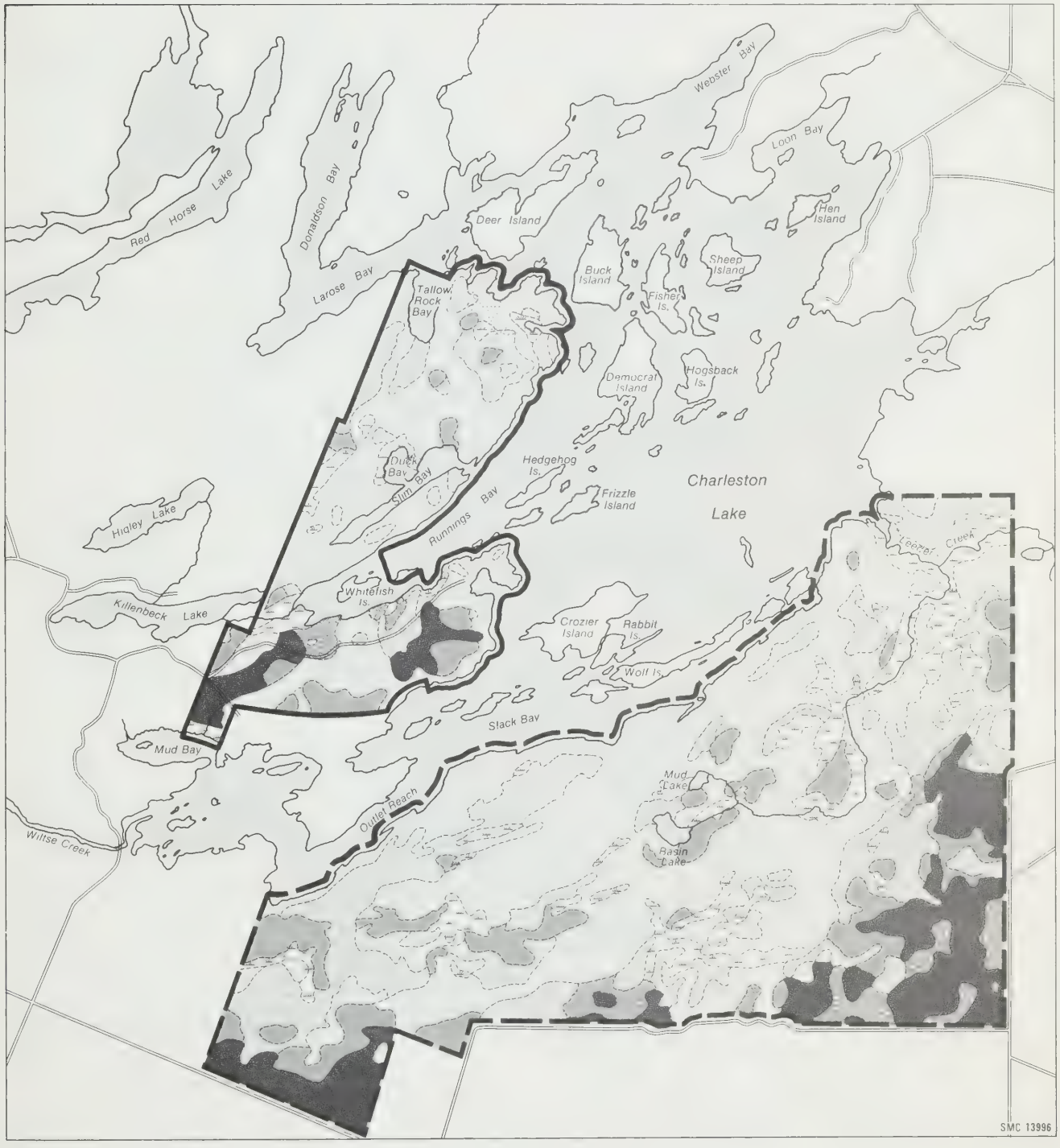
Existing park boundary

Blue Mountain Area boundary

Wet area

Rating	Soil Depth	Slope
Good	Medium 0.3 m — 1 m	Flat <3%
Fair to good	Medium 0.3 m — 1 m	Moderate 3%-10%
Fair	Shallow <0.3 m	Flat <3%
Poor	Shallow <0.3 m	Moderate 3%-10%
Very poor	Bare or	Steep >10%

Note: There are small local areas of excellent or very good development potential which have a soil depth of more than one metre and a flat or moderate slope.



Special Features and Sensitive Areas

- Existing park boundary
- Blue Mountain Area boundary
- Marsh
- Pitch pine concentrations
- D — Deer yard
- S — Black spruce
- B — Beaver
- H — Heronry
- O — Orchid
- F — Fern
- Vista
- Contour lines (50-foot intervals)

Black Lake
This lake is located near Leeders Creek on the northwest boundary of the planning area. Northern flora, such as pitcher plant and sundew, abound here. A visitor to the lake receives an impression of being in Northern Ontario. This area is another important example of the north-south transition theme.

Marsh Areas
Cattail marshes and the quiet, shallow waters nearby can be sensitive to certain recreational activities and to human intrusion. In a water-oriented park such as Charleston Lake, these shallow water areas are adversely affected by over-use and pollution.

Marshes are extremely important for the wildlife populations which they support. Four major marsh areas are present along the Charleston Lake shoreline. The marshes are located at the mouth of Leeders Creek, the south end of Runnings Bay, Duck Bay and the inlet south of Bloggett Point.

The marsh areas harbour significant populations of nesting waterfowl, red-winged blackbirds, coots and rails. Blue herons from nearby heronries, kingfishers, marsh hawks, osprey and other species feed there. Yellow and white water lilies and submerged aquatic plants are visible in the shallow water near the marsh. Beaver, muskrat, mink, water snake and a variety of frogs, turtles, fish, aquatic insects and invertebrates are common. Activity in these areas accelerates in fall and spring when migrating birds add to the variety of species to be seen.

A cattail swamp is located within the larger central swamp on the peninsula. Here, a large population of blue iris mixed with meadowsweet, speckled alder, willow and cattails provide for exceptional beauty. The major threat to this area is the drainage from Bayside Campground and Meadowlands Campground.

Duck Bay and Upper Mud Bay are special cases, as they represent the only known areas where loons nest in the park. With only a narrow inlet connecting Duck Bay to Slim Bay, the control of boats is quite feasible. By making Slim Bay and Duck Bay off limits to power boats, it will be possible to provide the protection which these birds need to nest and fledge their small families successfully. It is not feasible to control motor boats in Upper Mud Bay.

The Black Spruce Bog and Heronry
This area, located south of Blue Mountain, is of special importance for several reasons. Firstly, it contains the only known occurrence of black spruce in the area. Secondly, sphagnum bog is rare in the area and, when combined with black spruce, is a noteworthy documentation of the north-south transition theme. Thirdly, the heronry nearby is one of the few located in an eastern Ontario park and under the protection of the province. This colony is young and growing and is therefore a contrast to other known sites which are deteriorating. Fourthly, with the decline in the numbers of large birds of prey, this site has the distinction of supporting the only known red-shouldered hawk nest in the park. There is a distinct possibility that additional natural features of special interest can be found in this unique area.

Deer Yard
As mentioned previously, white-tailed deer populations are extremely low in this part of the province. The reasons put forth for this are lack of winter habitat and predation by wild dogs and hunters. Several areas within the park have the potential to be deer yards. These should be identified and managed to increase populations within the carrying level of the park environment.

Other Rare Fauna
The fauna of the Charleston Lake area, especially the less conspicuous species, have received little study, but generally seem to be representative of Eastern Ontario. The black rat snake is, however, rare in Canada and should receive some special consideration. This non-dangerous snake lives along the north shore of Lake Erie and in the Frontenac Axis areas in Leeds and Frontenac counties. It is the largest snake in Canada and has been all but eradicated by man's thoughtless actions. It is an extremely rare and threatened species which must be protected.

Rock Shelters
The location of the park, on the boundary of two major physiographic units, is significant as an earth science feature. These rock shelters occur where the Precambrian conglomerate rock meets the Paleozoic Nepean sandstone found primarily along the shoreline. The shelters resulted when layers of conglomerate (weakly cemented mixtures of quartzite pebbles) crumbled from beneath a cap of more resistant sandstone. Nature thus provided simple shelters for use by animals and man. Some of the early inhabitants left their mark in the form of mysterious symbols and designs known as pictographs in the shelters and on other sheer rock faces. The pictographs and the shelters need management plans to protect them from abuse.

Planning Issues and Conflicts

Charleston Lake has been frequented since the middle of the nineteenth century by people seeking a scenic area for outdoor recreation. A broad range of interests has led to a wide diversity in recreational activities. Some activities conflict with others and with the land on which they are based. In planning an area for outdoor recreation, it is important to isolate conflicting activities with buffer areas of open space and to provide sufficient land base for each activity in order to minimize any conflict between the activity and the resource.

The diversity of activities, from dispersed to concentrated and from consumptive to non-consumptive, can be accommodated satisfactorily within the Charleston Lake planning area. For some areas, it may mean that certain activities cannot be permitted. In large areas where separation is possible, most activities can be accommodated through appropriate zoning.

The Charleston Lake planning area is faced with the same development limitations common to all "shield" parks. The Precambrian Shield, with its scenic beauty, provides an environment for high quality recreational experience; but, at the same time, because of thin soils and extensive rock outcrops, it severely limits the type and intensity of use.

Rock outcrops dominate the landscape around Charleston Lake. Drainage is poor, and plant cover, which has taken hundreds of years to develop, is extremely sensitive to trampling. If the ground cover is destroyed through overuse, erosion of the thin soils can take place quite easily. The soil, once lost, may take centuries to replace. It is therefore very important to gauge the capacity of each area to support continued use by a pre-determined number of users. Recreational management plans will specifically state what development should take place and how many users the development will support without abusing the resource.

User/Resource Conflicts

White Pine and Aesthetics
White pine is commonly considered one of the most beautiful of our native trees. In much of the forest in the planning area, especially east of the lake around Blue Mountain, white pine is a dominant tree. It is, however, a successional community and occurs at only one stage in the biotic development of a forest. If left alone, then, the forest will mature to the climax stage and will be dominated by maple-beech trees.

A planning decision is therefore difficult, as it is impossible to have both a natural, undisturbed forest and large stands of aesthetically-pleasing white pine. Do we leave the forest alone and let natural processes take place, or do we manage for white pine in certain areas and maintain the white pine forest-type?

Pitch Pine/Trail User Conflict
The climax to the Blue Mountain trail system is Blue Mountain itself. It is the goal of snowmobilers and hikers alike, and use of the trail is growing. But besides being a goal to recreationists, Blue Mountain also harbours one of the largest stands of pitch pine in the area. At present, however, the stand is decreasing in size because the trees have been damaged by hikers using them as firewood, snowmobilers driving over them and people collecting their cones and foliage. The trees also suffer soil loss through erosion.

The decrease in the range and number of these trees in Canada is of extreme concern to ecologists, park planners, forests and people studying plant genetics. The pitch pine population in the park is therefore extremely important. However, while Blue Mountain is important for its pitch pine, it is also important for its outdoor recreation potential. Usually, when people and a resource come in contact, the resource suffers. Therein conflict exists.

User/User Conflicts

Day-user/Camper Conflict
In parks across Canada, it is a well-known fact that day-users and campers can be accommodated in the same area with proper planning, management and regulation.

Charleston Lake Provincial Park was originally designed as a camping park which did not offer beach facilities to day-users. The one gatehouse was supposed to sell campsite permits only, but there has been an increasing number of day-users permitted to utilize the park beaches and picnic area.

Park regulations require that park personnel be able to distinguish between day-users and campers. There are many problems inherent in enforcing the separation of the two types of users. For example, only campers are supposed to use the campgrounds and campground roads. Also, picnickers may be either campers or day-users, and day-users often park illegally in the campground area. Park rangers have difficulty enforcing the park closing hour of 11:00 p.m. because of the problem distinguishing between campers and day-users. There are no regulations governing the separation of the different types of users, and enforcement by rangers becomes impossible where the vehicles of day-users and campers are allowed in the same area. All these problems can be solved by separating day-user and camper cars at a control point. Day-use vehicles would be parked in a day-use parking area outside the campground.

Hunter/Trail User Conflict
Here again are two recreational uses which can occur simultaneously. To eliminate conflicts between these user groups, the area available for hunting will require visible boundary markers so that each group is fully aware of the area available for use.

Powerboater/Swimmer Conflict
In areas with beaches or in areas where short distances to islands tend to lead swimmers some distance from the shore, the fast-moving boat presents an immediate safety hazard. Swimmers are not highly visible in the water, and so are endangered by the presence of powerboats. A malfunction in the steering or speed control mechanism of a fast-moving boat, sweeping through a swimming area, can cause instant disaster.

These two activities must therefore be separated by an adequate water buffer.

Powerboater/Canoeist Conflict
In planning for water-oriented outdoor recreation, a conflict which often occurs is that between powerboaters and canoeists. A large part of the canoeing experience is the enjoyment of a scenic area without unnatural noises and intense development. The canoeists complain about the safety hazard caused by the wake of a speeding boat and the noise of motorized craft. It is obvious that the activities of canoeists and powerboaters are incompatible.

Snowshoer/Snowmobiler/Skier Conflict
These three outdoor recreational activities conflict with each other. Snowmobilers complain that skiers and snowshoers present a safety hazard on the trails, while skiers and snowshoers complain about the ecological damage and noise caused by the machines. Skiers complain about snowshoers ruining their track and making skiing more difficult. The complaint about littering is common to all of them. In short, these uses are incompatible with each other especially on the same trail system.

A trail designed for snowshoeing cannot be used by snowmobiles because of the safety hazard. The noise is also annoying to the snowshoer. Use of a snowmobile trail by skiers creates a hazard both for the skier and the snowmobiler. Snowmobile trails are also unsuitable for skiing because the hard-packed snow makes skiing difficult. If snowshoers use a ski trail, they break up the ski tracks making skiing slower and less enjoyable. A trail cannot accommodate two or more of these activities without lowering the quality of the recreational experience.

In a small area, some conflicting activities must be eliminated. But in a large area, all three can be accommodated with little or no conflict through zoning and facility site planning. Good planning requires the separation of these recreational activities in order to produce the desired satisfaction for all parties.

Cottager/Park User Conflict
Some conflicts have already been experienced with cottagers who usurp facilities intended for park users. One such conflict arose over the day-user beach which exists between two campgrounds. This can be solved by relocating the day-user facilities.

Within a large park which contains alienated land, as now exists in a mosaic throughout much of the eastern area, the possibility of park-users trespassing on private land is always present. Through a program of acquisition and boundary marking, this conflict can be eliminated.

Carrying Capacity

The capacity of any given land base for recreational use depends upon factors such as the physical or ecological limitations of the resources, the perceptual or psychological tolerances of the users and the park management goals and objectives. In the Charleston Lake planning area, the specific physical conditions which limit the degree of recreational use include shallow soils, steep slopes and rugged topography (Figure 11). The objectives of park management include the conservation and retention of these fragile and exceptional resources. The visitors, on the other hand, come to the park seeking natural environment experiences and activities associated with the area's resources.

The Provincial Parks Classification System classifies parks according to the potential and carrying capacity of their area. It sets restrictive zoning guidelines which recognize special features and regulate development. The Charleston Lake Provincial Park will be designated as a natural environment park under this system. By doing this, development will be set within restricted guidelines which reflect the potential and carrying capacity of this area. Through management programs, the type and intensity of activities can be regulated. In turn, the quality and type of user experience will be controlled.

The information in Table 8 represents standards for developing facilities and activities and provides the maximum capacity to which the resources may be developed. Beyond these optimums, the environment may be adversely affected. The principle goal for setting these criteria has been to maximize visitor satisfaction within administrative, budgetary, user and resource constraints.

Additional standards have been recommended for park development and use and are outlined in the Ministry of Natural Resources' *Ontario Provincial Parks Landscape Design Guidelines and Standards* (Draft, 1976).

The standards and limitations which the park's carrying capacity dictates will be closely monitored to ensure proper conservation of the area's resources. Development and programs will be cut back or altered in order to meet the carrying capacity restrictions.

Table 8: Summary of Facility Capacity by Activity

Activity	*Unit*	*Capacity*
Camping		
Auto	227 campsites	900 people
Interior	24 campsites	108 people
Group	3 areas	150 people
Total camping capacity		1158 people
Swimming (beach capability)		
Development Zone	224 m	710 people
Total swimming capacity		710 people
Walking or snowshoeing on designated trails		
Development Zone	8 km	125 people
Natural Environment Zone I	3.2 km	50 people
Natural Environment Zone II	24 km	72 people
Natural Environment Zone III	3.2 km	50 people
Total walking or snowshoeing capacity		297 people
Hiking on designated trails		
Natural Environment Zone I	6.4 km	40 people
Natural Environment Zone II	32 km	200 people
Nature Reserve Zone	8 km	25 people
Total hiking capacity		265 people
Back-packing		
Development Zone	4.8 km	20 people
Natural Environment Zone I	12.8 km	16 people
Total back-packing capacity		36 people
Cross-country skiing on designated trails		
Natural Environment Zone I	9.6 km	60 people
Total cross-country skiing capacity		60 people
Snowmobiling on designated trails		
Natural Environment Zone II	24 km	45 people
Development Zone	3.2 km	50 people
Total snowmobiling capacity		95 people
Picnicking		
Natural Environment Zone I	3 wayside stops	24 people
Natural Environment Zone II	3 wayside stops	24 people
	1 summer staging area	40 people
Natural Environment Zone III	9 picnic sites	360 people
Total picnicking capacity		448 people
Parking		
Development Zone	park office	5 cars
	visitor centre	100 cars
	campground office	10 cars
	group campground	
	boat launch	20 cars
	far beach	10 cars
	interior camping staging area	10 cars
	near beach, amphitheatre	75 cars
Natural Enrivonment Zone I	staging area	25 cars
Natural Environment Zone II	summer staging area	20 cars
Total parking capacity		275 cars
Summary of total summer park capacity		
Total camping capacity		1158 people
Total summer day-use trail capacity		300 people
Total day-use picnicking capacity		424 people
Total park capacity		1882 people

Note 1: Management controls will regulate interior camping accordingly:
canoe access from the interior;
canoe access from the park;
hiking access from the park.

Note 2: Day-use trails include:
32 km Natural Environment Zone II hiking/snowmobile trails
8 km Nature Reserve Zone interpretive hiking trail
4.8 km Development Zone interpretive walking trail

Park Concept Components

From the resource investigation and the standards established previously, ideas have been developed for facilities and activities which would be complementary to the park's concept. The activity components have a great potential to maximize the user's experience while in the park. The following activities and facilities were found to be suitable for Charleston Lake Provincial Park and Blue Mountain area.

The following Figure 12 illustrates the possible location of some of the activity components. Additional facilities, such as trail routes, which are site specific, and the refinement of the proposed routes will be more specifically identified at the site planning stage. The facilities and activities will be managed to ensure the conservation of the area's resources.

Scenic-Historic Route

The surrounding Leeds County has a wealth of historic and aesthetic features which would complement the outdoor recreation experience at Charleston Lake. A variety of routes could be defined which would feature such points of interest as the site of the first glassworks established in Upper Canada at Mallorytown. Any route could well form a portion of the proposed scenic drives going northward from Kingston. A route of approximately 96 km would take park visitors around Charleston Lake and through the villages and work places of the early settlers of the area who also used the shoreline of Charleston Lake for recreation. A brochure describing nearby points of interest is available from the park office.

The nearby communities sometimes organize local fairs and festivals to celebrate various occasions. The opportunity to add such activities to the visitor experience package would prove extremely popular.

Canoe Route System

Charleston Lake, as well as the other lakes and streams in the area, offers outstanding opportunities for day-use and extended-use canoeing. The potential exists to develop a series of looped and one-way canoe routes going west from Charleston Lake and connecting up with the Rifeau system to the north and the St. Lawrence River to the south. These routes, in association with facility development on adjacent Crown lands, would add a further recreational dimension to the program offered at Charleston Lake Provincial Park.

Trails System

The climate, snowfall and the extent and variety of landscape give the planning area potential to support a variety of dispersed, linear recreational activities. Hiking, snowshoeing, cross-country skiing, snowmobiling and bridle trails can be accommodated. Table 9 provides an overview of trail possibilities with ratings for benefits, challenge, recommended facilities and visitor experience potential.

A winter trails program should be combined with external trail systems. But, within Charleston Lake planning area, the development limitations should be the primary consideration in the design of future winter trails.

Crown Land Recreation Program

Several parcels of Crown land are located adjacent to Charleston Lake or are easily accessible from the existing park by road, trail or waterway. The majority of the lots are maintained under forest management programs. Some lots, though, are suitable for potential recreational activities or wildlife production. For example, the Killenbeck access zone and the Lost Bay area on the Gananoque River are classified primarily for recreation and then for other resource uses. More specific on-site investigations of these lands will identify their prime uses. If after acquisition by the Crown, these lands are identified as suitable for pasturing, then they will be leased for this purpose on a short-term basis.

Day-use Recreation Area

Most day-users are searching for water-based facilities where they can participate in such activities as sunbathing, swimming, boating, picnicking and active play. The beach potential and, thus, the water-based activity potential in the Charleston Lake planning area are very limited. Shallow soils, steep rocky shorelines, mud or rock wet beach areas and limited sand beach areas prevail.

Some limited beach areas have been developed in the existing campground area. Even though day-use activities have been allowed in one section of this beach, the area does not have the capacity for both campers and day-users. Therefore, if another area is to be provided to meet the increased demand for water-based, day-use activities, then it seems more appropriate to go outside the planning area to find and develop a suitable location.

Concept Components

- Existing park boundary
- Park area
- Blue Mountain Area boundary
- Crown land
- Scenic/historic auto route
- Charleston Lake-Gananoque Watershed Canoe Route
- Leeders Creek Exploratory Canoe Route
- Upper Beverly Lake-Gananoque Watershed Canoe Route
- Sites examined for day-use recreation
- Boat launching

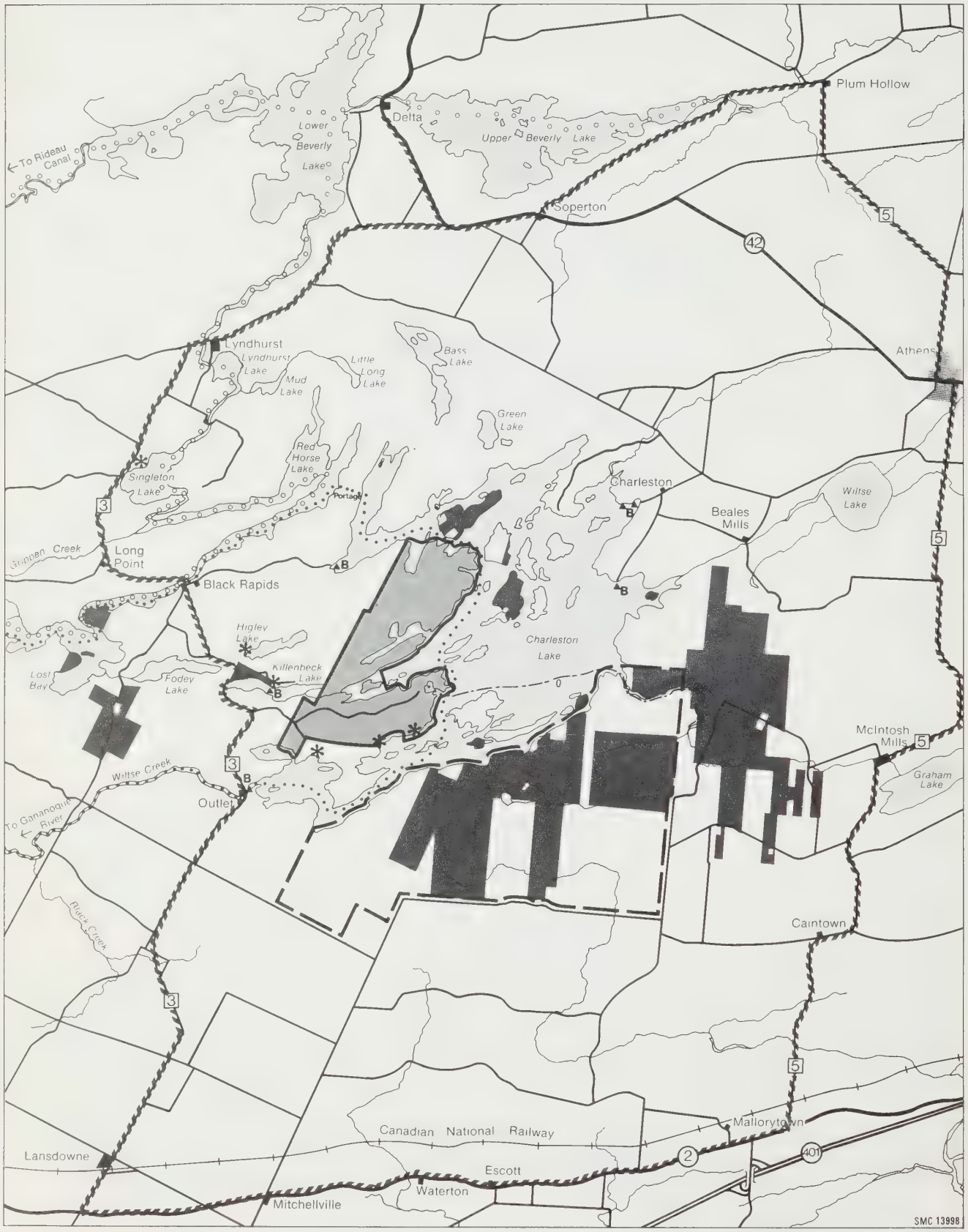


Table 9: Trail Activity Potential

Type of Trail	*Length*	*Purpose*	*Degree of Difficulty*	*Facilities*	*Type of Experience*
Walking		Outdoor education and interpretation; dispersed recreation opportunity	Low - Medium	Interpretive exhibits	Recreation-education
Snowshoeing	3.2 km	Introduction to natural environment; Light-Moderate exercise and physical challenge		Trail development: High	
Canoe Route Portages	As short as possible; max. 1.6 km	Dispersed recreation opportunity; link between waterways for day-use and extended natural environment pursuits	Low	Trail development: High	Recreation-natural environment
Snowmobiling	16 km	Dispersed recreation; Light-Moderate exercise and physical challenge	Low	Staging areas; wayside stops; trail development: High	Recreation
Cross-country Skiing	6.9 km	Dispersed recreation opportunity; introduction to natural environment; Moderate-Heavy exercise and physical challenge	Low	Wayside stops; Trail development: Medium-High	Recreation-natural environment
Hiking	3.2 - 16 km	Dispersed recreation opportunity; day-use natural environment pursuit; Moderate-Heavy exercise and physical challenge	Medium	Wayside stops; Trail development: Low-High	Natural environment
Back-packing	16 km +	Dispersed recreation opportunity; extended natural environment pursuit; Moderate-Heavy exercise and physical challenge.	Medium-High	Interior campsites; Trail development: Low-Medium	Natural environment

Note: The type of trail will be determined by:
(1) terrain considerations i.e. slope, soil, natural obstacles;
(2) development considerations i.e. amount of marking, route lay-out, construction standards;
(3) requirements of the mode of travel;
(4) purpose of trail i.e. leisurely stroll vs. physical challenge.
All trails have marking and bridging where required.
Scenic views and lookouts will be incorporated into trail design.

Using the limitations approach, six alternative sites (shown in Figure 12) were examined in detail and rated on the number of inherent physical limitations and the degree of seriousness of each. A property on Singleton Lake received the best rating. Therefore, it is recommended this property be acquired to provide the quality and quantity of day-use activity which would complement the park plan.

Two other day-uses which appear to be non-conforming and incompatible are snowmobiling and hunting. These pursuits will not be permitted, and thus visitors to a natural environment park will not experience a conflict of interest when in the zones of the existing park. However, in the interests of area planning, the Blue Mountain area, the Crown islands in Charleston Lake and additional Crown lands to the east of Blue Mountain would perhaps be more suitable for these activities. The planning team and the public could not substantiate any reasoning which would exclude hunting and snowmobile use from certain designated areas. However, the identification of many unique and sensitive features in these additional areas makes it expedient to add them to regulatory process.

Park Policy

Park Goal

The goal of Charleston Lake Provincial Park is to provide a variety of high quality, year-round, dispersed, resource-oriented recreational opportunities associated with an exceptional natural environment and a rich cultural background.

Park Objectives

The objectives of Charleston Lake Provincial Park are:
- To integrate park and recreation development and activities with the physical and cultural resources of the Charleston Lake area in order to retain the quality and character of the environment.
- To accentuate and interpret the exceptional natural environment through the development of resource-oriented facilities and the provision of visitor services programs for recreation programming, communications, interpretation and outdoor education.
- To provide and maintain a locale to accommodate a variety of year-round, resource-oriented recreational activities such as camping, canoeing, hiking, nature study, cross-country skiing, snowshoeing, snowmobiling, hunting and fishing.
- To protect and preserve those unique and special natural and cultural features and, where appropriate, to interpret their importance to the park visitor.

The emphasis, as expressed in the park goal and objectives will be upon the provision of a wide variety of dispersed, year-round recreational opportunities consistent with the geological, biological, archaeological and historical resources of the park. The program will attempt to achieve balance and harmony among the various consumptive recreational uses, as well as between recreational use and the physical and cultural resources. The park concept will integrate the various activities and areas into a year-round, diverse recreational complex based upon the capability of resources to sustain use as well as the recreational needs and interests of the market area.

The major portion of the park will be left relatively undeveloped to retain a high quality "natural" setting for dispersed activities. Facilities to accommodate camping, hiking, canoe-tripping, nature study, cross-country skiing, snowshoeing and snowmobiling will be developed to blend with the natural environment.

More intensive development, including auto campgrounds, swimming areas, visitor centre and service facilities, will be confined to a small portion of the park. The development of these facilities will be in keeping with the character of the landscape, so as to retain the high quality of the natural setting and to provide the visitor with opportunities for natural environment experiences.

Although the goal and the objectives pertain specifically to the existing Charleston Lake Provincial Park, they also apply to the planning, management and development of the Blue Mountain area and Crown islands. The master plan recommends that these areas, now outside the existing park, be incorporated under the regulations of The Provincial Parks Act. All areas will be incorporated as part of Charleston Lake Provincial Park, and the park policy will pertain to the whole.

Park Classification

The exceptional natural and cultural features of the Charleston Lake area, some of which are unique to Ontario and even Canada, make this area a very significant, outstanding recreational and educational resource. Accordingly, Charleston Lake Provincial Park will be classified as a Natural Environment Park under the Ontario Provincial Parks System.

The park management, recreational development and program will be in keeping with this classification and in accordance with the guidelines set down in the *Administrative Policies of the Ontario Provincial Parks System* (1975) and the specific policy recommendations of this plan.

Zoning

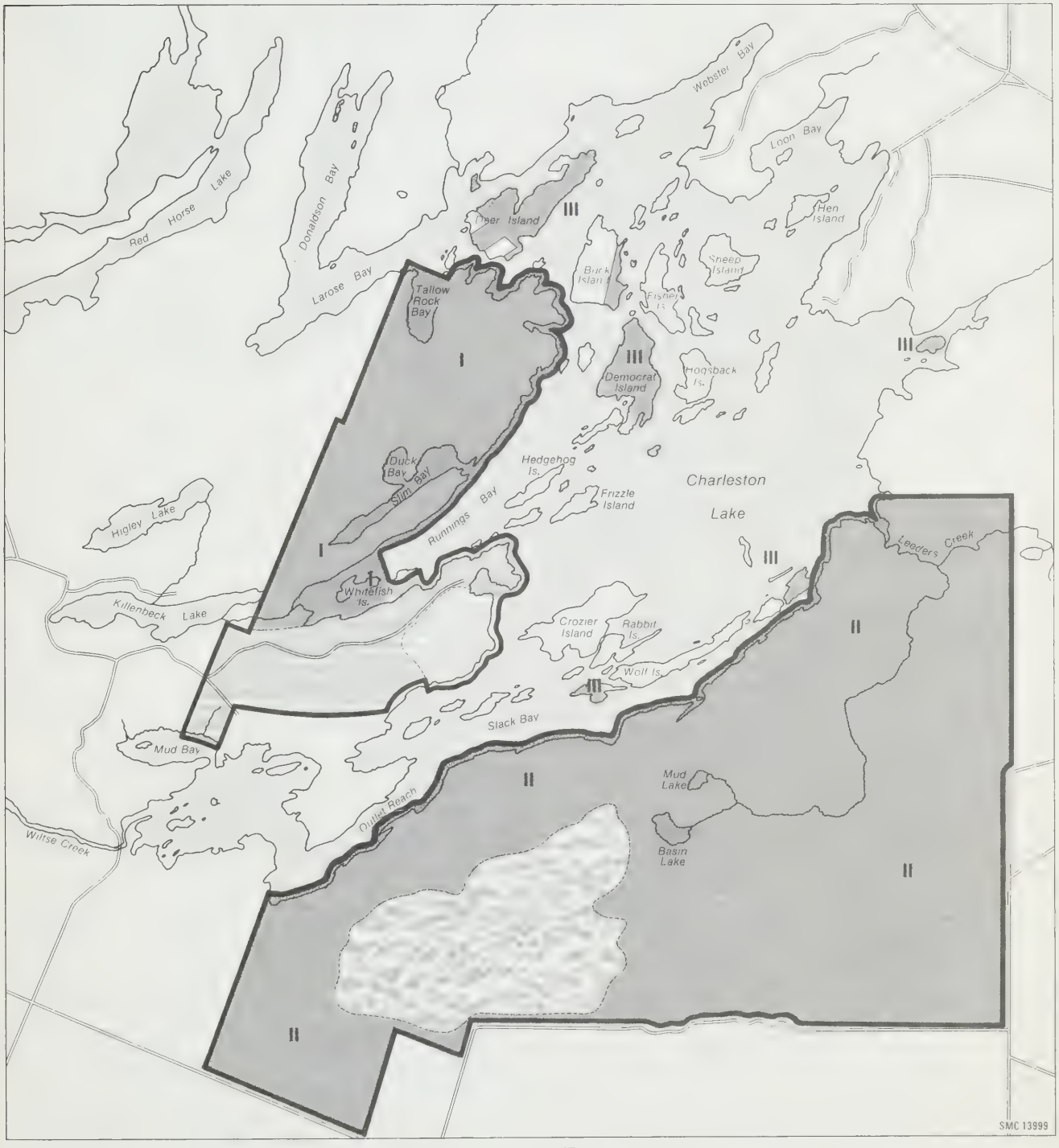
Charleston Lake Provincial Park will be divided into zones for the purpose of programming and regulating uses (Figure 13). Through these six zones, the integrity of the landscape will be retained, special features (geological, biological and cultural) will be preserved and protected, and conflicts between various uses will be minimized. Resource use and guidelines will be outlined according to the zoning structure and in keeping with the park goal and objectives.

Charleston Lake Provincial Park will have a total area of approximately 3,855 ha. The area will be divided as follows:

Zone	*Hectares*
Development Zone	289
Nature Reserve Zone	426
Natural Environment Zone I	618
Natural Environment Zone II	2339
Natural Environment Zone III	144
Historical Zone	39
Total	3855

Zoning

- Development Zone
- Nature Reserve Zone
- Natural Environment Zone I
- Natural Environment Zone II
- Natural Environment Zone III
- Historical Zone
- Proposed park boundary



Development Zone
The development zone consists of 289 ha primarily located on the peninsula jutting out into Charleston Lake in the southwest corner. The zone is bounded on the west by the park boundary which cuts through the easterly end of Killenbeck Lake. The northern and southern boundaries of the zone are formed by Runnings Bay and Slack Bay, respectively. The southern extremity of the zone is further delineated by the Rear of Leeds and Lansdowne Township Road and the historical zone in the southeastern part of the peninsula.

The southern half of this zone has slightly rolling topography, which gives way in the east to a more rugged and exposed terrain terminating in shoreline cliffs. The northern section of the zone is characterized by a series of ridges running parallel to Runnings Bay. A number of flatter areas, having medium soils, suitable for development are located in the central and western parts of the zone.

The forest cover consists primarily of tolerant hardwoods such as sugar maple, oak and hickory. Juniper and white pine are found scattered throughout the zone. Some of the more level, medium-deep soil areas were formerly cleared and now exist as open meadows supporting a variety of plant growth including grasses and wildflowers. A range of outstanding natural and cultural features are present in this zone. An iris-cattail swamp is centrally located. A scenic sandstone escarpment forms the eastern shoreline of the peninsula. On one of the upland ridges running parallel to the escarpment, there is a notable stand of hemlock.

The primary purpose of designing the area as the development zone is to provide moderate intensity auto camping and interior camping (pack-in and boat-in) within an exceptional natural environment. The zone also provides for public access to Charleston Lake with boat-launch facilities and staging areas for snowmobiling, cross-country skiing, hiking and snowshoeing. Group camping, park administration and visitor services facilities will also be functions of this zone.

The existing park development includes auto campsites complete with table and firegrill, water supply, four comfort stations, sixteen vault privies, 9.6 km of park roads, 244 m of beach, boat launch, amphitheatre, the 3-km Woodland Interpretive Trail, four change houses and a trailer sanitary station. Administrative facilities include the park office, maintenance building, storage building and campground control office. Additional facilities to be developed are listed in Table 10.

The most intensive development of the park will take place in this zone to accommodate active, outdoor recreation activities and services associated primarily with extended use. Auto campsites, interior camping and group camping areas with service facilities will be provided. The standard unit group composition will be two tents and/or two canoes per group. The maximum capacity for each interior campsite will be six persons.

In conjunction with camping activities, swimming, canoeing, boating, fishing, bicycling and interpretive facilities will be provided. Seasonal activities such as snowshoeing and cross-country skiing will be permitted throughout the zone. Snowmobiling, however, will be restricted to designated roads.

With regards to resource management in this zone, reforestation will be carried out in open meadow areas as buffering between sites. Stand improvement for silvicultural, educational and aesthetic purposes will be carried out according to an approved forest management plan. Efforts will be made to retain scenic areas of vegetation growth such as wildflowers and grasses.

Fish and wildlife habitat improvements will be carried out within an approved management plan. Special attention will be paid to the waterfowl habitat in Mud Bay.

Nature Reserve Zone
The nature reserve zone consists of 426 ha, encompassing Blue Mountain, the spruce bog to the south and Long Mountain to the southwest. Long Mountain serves as the northwest boundary of the zone, and the Junetown road marks the southern limit.

A series of progressively rising bedrock ridges runs south from Charleston Lake and north from the Junetown road. These ridges meet to form Blue Mountain, one of the highest points in the eastern region at 194 m. The mountain affords a spectacular panoramic view of the lake and the surrounding countryside.

Forest cover in the zone includes rare stands of pitch pine located on the ridges and at the peak of Blue Mountain. Outstanding stands of white pine occupy the slopes, while the ravines and valleys have representative stands of such hardwood species as oak, beech and maple. Topography and soil conditions limit the productivity of this zone.

There are several unique natural features which make this the most significant natural zone in the region: the black spruce bog, the heronry, pitch pine, beaver activity, the mountain vista, eagles and the migratory flights of hawks. The purpose of making this area a nature reserve zone is principally to protect and preserve the many unique features. Research and low intensity recreational use, such as interpretation and outdoor education, may be promoted so that the zone can contribute to the visitor experience.

Access trails and their related facilities account for the only existing development in this zone. Developments and programs will proceed as in Table 11.

For this zone, the outdoor recreation program will provide for a variety of low intensity recreational activities associated with outdoor education and scenic viewing, such as hiking, snowshoeing, cross-country skiing, interpretation and photography. Access to and travel within the zone will be restricted to designated trails. Overnight camping, open fires, and mechanized travel will not be permitted. The management of vegetation and fish and wildlife will be left to natural processes.

The acquisition of all private lands within this zone will be of high priority. Protective buffer areas will be established between the individual features, such as Blue Mountain and the spruce bog.

Research on pitch pine will be encouraged within the park and Ministry programs. Additional research is needed in both the earth and life sciences to determine if any other significant features exist in this zone and to define precisely the significance of the previously identified features.

Table 10: Proposed Development in the Development Zone

Facility	*Function*	*Size*	*Use Standard*	*Limitations*	*Optimum Carrying Capacity*	*Facilities*	*Facility Standards*
Bayside Campground							
Auto Campsites	Camping; services	8 ha	9-10 campsites/ha	Slope, soil depth	75 sites 300 people	Comfort station, water supply, tables, fireplace grills, garbage receptacles	1 comfort station/ 50 campsites; 1 outlet/ 10 sites; 1 of each/ site
Beach	Bathing, swimming and water-related play	0.7 ha	18.5 sq m/ person	Artificial beach; lack of backshore; drainage	370 people	Designated swimming area	
Playfield	Active recreation	0.4 ha	125 people/ ha		50 people		
Meadowlands Campground							
Campground and Playground	Active and passive recreation	0.2 ha	250 children/ha		50 children	Comfort station, water supply, tables, fireplace grills, garbage receptacles	1 comfort station/ 50 campsites; 1 outlet/ 10 campsite 1 of each/ site
Campsites	Camping; services	8 ha	9-10 campsites/ha	Drainage, soil depth	75 sites 300 people	Comfort station, water supply, tables, fireplace grills, garbage receptacles	1 comfort station/ 50 campsites; 1 outlet/ 10 sites; 1 of each/ site
Shady Ridge Campground							
Auto Campsites	Camping; services	7.2 ha	9-10 campsites/ha	Slope; soil depth	75 sites 300 people	Comfort station, water supply, tables, fireplace grills; garbage receptacles	1 comfort station/ 50 campsites; 1 outlet/ 10 sites; 1 of each/ site
Beach	Swimming, bathing and water-related play	6317.4 sq m	18.5 sq m/ person	Limited backshore and length	340 people	Designated swimming area	
Group Campground							
Campsites	Camping; services	6 ha	1 campsite/ 2 ha	Soil depth; drainage	3 sites 150 people	6 privies, parking, water supply	2 privies/ site
Playfield	Active recreation	2 ha					
Interior Campsites							
			6 people/ unit max.; 2 campsites/ 1.6 km of shoreline; 6 units/ campsite max. (taken from N.E.Z.I)		10 sites 60 people		
Service Areas							
Boat Launch	Launching and docking for water craft			Slope			
Trail Parking	Staging areas		0.2136 sq m/ vehicle			Parking for 75 cars	
Trailer Sanitation Station							
Visitor Centre							
	Information, education and interpretation					Parking lot for 100 cars	

Table 11: Proposed Nature Reserve Zone Development

Component	Year-round multiple-use trails
Functional Unit	
Function	Day-use; trails for year-round recreation (i.e. hiking, snowshoeing); interpretation; vista
Size	8 km
Use Standard	4 visitors/km
Limitations	Sensitive areas; slope; soil depth
Optimum Carrying Capacity	25 visitors/day
Facilities	Trails; interpretive exhibits
Facility Standards	2.5 km/200 campers

Natural Environment Zone I
This zone consists of approximately 618 ha and encompasses all the land and water lying between the western boundary of the park and the development zone. The land portion is a peninsula with several deep bays, of which the most noteworthy are Tallow Rock Bay to the north and Slim Bay to the south.

The zone is composed essentially of steep, rugged ridges running north to south with shallow soils and exposed bedrock. This zone has numerous pockets of deeper soils and is less rugged than the land to the south of the lake. It is therefore more productive and accessible. In the past, logging for white pine was very successful. Dominant hardwood stands have since re-established here.

Natural environment zone I has the greatest potential for comprehensive interpretation because of its array of natural and cultural features and its easy access through the park's development zone. Pitch pine, hooker's orchis, showy orchis and walking fern are botanical features unique to this zone. Beaver ponds, loon nesting sites in Duck Bay, a deer yard and several outstanding vistas add to the interpretive potential. Cultural features, such as the first patented land in the area, archaeological sites and early mineral prospecting, add to the interpretive potential of this zone.

This purpose of designating this area as natural environment zone I is to provide dispersed recreation with a comprehensive interpretive program which focuses upon and is compatible with the significant features of the zone. Trail facilities will be designed to stimulate exploration and discovery in a natural setting. The zone will allow moderate intensity interior camping by providing boat-in and pack-in campsites.

This zone presently has about 3.6 km of walking trails (including 244 m of boardwalk). There are four in-holdings within the zone, three cottages and one trapper's cabin.

Facilities and programs which should be provided in this zone are listed in Table 12.

Outdoor recreation in this zone will be developed and programmed for non-mechanized dispersed recreation. However, for safety purposes, a service corridor for snowmobiles will be allowed as a winter portage from Killenbeck Lake to Runnings Bay.

Interpretive exhibits and facility developments will diminish in intensity as one progresses into the zone. The emphasis here will be on nature study and outdoor education. Hiking, snowshoeing, cross-country skiing, canoeing or other non-mechanized boating, interior camping, viewing, photography and fishing will be permitted.

Fires will be permitted in designated areas only. Power boating will be prohibited, and water and land boundaries and regulations will be posted.

Vegetation cover will be managed in accordance with a management plan. Pitch pine will be protected through facility design and location. The management plan will include regulations for habitat improvement for deer, fish and waterfowl. The acquisition of Pike Island will be of high priority in any land management plan.

Research within Ministry programs will be supported. Two areas of research should include the pitch pine and the archaeological sites. The latter will try to determine the significance of the sites and how best to utilize them in the visitor service program while affording them maximum protection.

Natural Environment Zone II
This is the largest zone in the park, comprising 2,339 ha. The zone includes the land along the southeast shore of Charleston Lake from Leeders Creek to Gavins Bay, south and east along the Warburton and Junetown roads to the east boundary of the Rear of Leeds and Lansdowne townships. Most existing private inholdings, primarily cottages, are excluded from the zone. However, several farms are being held as private inholdings despite the marginal capability of the zone for farming. As inholdings become available, they should be considered for incorporation into regulation.

The land rises steeply from the shoreline and the aforementioned roads in a series of ridges which run from northeast to southwest. These ridges have exposed bedrock crests with shallow soils covering the slopes. Deeper soils and rolling, rather than rugged, terrain occupies the eastern portions of the zone.

Natural vegetation succession to hardwoods is apparent throughout the zone. White pine stands now dominate the slopes and ridges. However, hardwood species are gradually infiltrating these stands by moving up the slopes from the deeper, more productive soils in the valleys. Pitch pine may be found scattered throughout the central and western portions of the zone.

The zone's predominant features relate to its fish and wildlife potential. For example, Leeders Creek provides a good waterfowl habitat, while Basin Lake and Mud Lake provide an opportunity for put-and-take fishing for cold water species. In addition, there are many fine scenic views and vistas. Pitch pine is the most unusual botanical feature. Black Lake, just beyond the eastern zone boundary, is an outstanding example of a northern-like environment and its associated vegetation growth. Additional inventories are needed to determine the total significance of this zone.

Table 12: Proposed Natural Environment Zone I Development

Facility	*Function*	*Size*	*Use Standard*	*Limitations*	*Optimum Carrying Capacity*	*Facilities*	*Facility Standards*
Year-round Trails							
Loop A	Self-guiding interpretive trail for year-round use	1.2 km	16 people/ km	Slope; soil depth	400 people/ day	Direction markers, interpretive stations	1 marker/ 106 m; 1.6 km/ 100 campers
Loop B	Primarily walking and snowshoeing; common access for all pedestrian trail activities (education)	2.0 km	16 people/ km	Slope; soil depth	400people/ day	Direction markers, interpretive stations	1 marker/ 106 m; 1.6 km/ 100 campers
Summer Trails							
Portage	Travel link between Runnings Bay and Killenbeck Lake for canoeists (service)	0.8 km		Soil depth; other trail activities		Markers, landing	
Hiking	Day-use trail for travel over rugged natural conditions (recreation)	6.4 km	6 people/ km	Soil depth; sensitive areas	320 people/ day	Wayside stops, direction markers, crossing at Slim Bay Gap	1 stop/3 km; 1 marker/ 91 m; 1.6 km/ 50 campers
Back-packing	Extended-use trail for travel over rugged natural conditions (recreation)	12.8 km	Regulated by interior campsite occupancy	Soil depth; sensitive areas	60 people/ day	Wayside stops, direction markers	1 stop/ 3 km; 1 marker/ 364 m
Winter Trails							
Cross-country Skiing	Day-use trail (recreation)	9.6 km		Slope; climatic conditions		Wayside stops, direction markers	1 stop/ 3 km; 1 marker/ 45 m
Snowmobile Corridor	Right-of-way for snowmobiles allowing access to Runnings Bay from Killenbeck Lake (service)	0.8 km		Other trail activities; climatic conditions			
Interior Campsites							
Camping Unit Service Area and Landing Area	Natural environment campsites offering a degree of isolation, accessible via foot and/or watercraft		6 people/ unit max.; 2 campsites/ 1.6 km of shoreline; 6 units/ campsite max.	Slope; soil depth; shoreline conditions; archaeological sites	10 units 60 people	Fireplace, trails, privies	Based on 6 people/unit site development criteria will be for 2 tents and 2 canoes

Designating this area as a natural environment zone provides for a wide variety of recreational activities. For example, the inadequate network of trails will be expanded and developed for year-round use to accommodate hikers, snowshoers and snowmobiles. These trails will link up with trails on adjacent Crown lands. Staging areas and wayside stops will be provided. Facilities and standards which will apply to this zone are shown in Table 13.

With regards to outdoor recreation management, this zone will be managed to provide for multiple-use outdoor recreation, both consumptive and non-consumptive, as part of formal and informal programs. Recreational activities permitted will include hiking, snowshoeing, picnicking, fishing, hunting, photography, snowmobiling, viewing and outdoor education.

The zone will be posted as a hunting area during regular seasons for deer, upland game and waterfowl. Trail layout and design will allow for the protection of sensitive features such as pitch pine. Cooking fires will be permitted in designated areas only. Overnight camping will not be permitted.

The vegetation will be managed under the controls of an approved forest management plan. Reforestation of abandoned farmland will be according to the plan. White pine will be managed to maintain high quality, uneven-aged stands for aesthetic and recreational purposes.

Habitat improvement for fish, deer and upland game will follow a fish and wildlife management plan. For example, the fisheries management will be carried out to improve the put-and-take fishery in Mud Lake and Basin Lake. Wildlife management will be designed to improve upland game and waterfowl hunting in the Leeders Creek area.

A program of land acquisition will establish priorities for inholdings within the zone. Research within Ministry programs will be supported for pitch pine, and studies into the environmental impact and management techniques for trails will be supported.

Natural Environment Zone III

This zone covers all the Crown-owned islands or parts of islands in Charleston Lake. These total about 144 ha and range in size from small rock reefs, which are visible only during low water periods, to ones over 40 ha. The larger islands have fairly homogeneous conditions: rocky shorelines, shallow soils and sensitivity to intensive use, while the smaller islands consist mostly of rock.

Much of the scenic quality of Charleston Lake can be attributed to its many islands. Grouping the islands into one zone allows for more effective control and management of this resource. To retain the physical well-being of the islands, only those of 4 ha or more, having suitable soil conditions, will be included in the park recreation programs. Recreational use and development will be strictly controlled.

Some controversy now exists concerning the ownership of several islands in Charleston Lake. Private development, such as cottages and docks, are located on some islands which are considered to be Crown-owned. Still other islands have been informally used for camping and day-use. Some designated picnic sites have been established within Ministry programs and include picnic tables and garbage receptacles. Management proposals will need to resolve these issues before they can be effective.

Facilities and standards which will apply to this zone are listed in Table 14.

Designated picnic sites with facilities will be established to provide a land base for such water-oriented activities as boating, fishing, canoeing, snowmobiling and cross-country skiing. Day-use recreational activities such as picnicking, swimming, sun-bathing, photography and viewing will be limited. Overnight camping will be prohibited. Development will occur only on islands of sufficient size with the necessary soil and beach qualities to sustain use.

Table 13: Proposed Natural Environment Zone II Development

Facility	*Function*	*Size*	*Use Standard*	*Limitations*	*Optimum Carrying Capacity*	*Facilities*	*Facility Standards*
Year-round Multiple-use Trails							
Hiking	Day-use trail for travel over rugged natural conditions; summer recreation	24 km	6 people/ km	Private land; slope; soil depth; sensitive areas	150 people/ day	Wayside stops, direction markers, summer landing, winter staging area, summer staging area	1 stop/ 8 km; 1 marker/ 91 m
Snowmobiling	Day-use trails for winter recreation	24 km	2 snowmobiles/ km		45 snowmobiles/ day	10 picnic sites with facilities, 1 privy, 20 parking spaces	
Snowshoeing	Day-use trails for winter recreation	24 km	3 people/ km		75 people/ day		

Note: These trails fit into a trails network which includes Crown land to the east.

Table 14: Proposed Natural Environment Zone III Development

Facility	*Function*	*Size*	*Use Standard*	*Limitations*	*Optimum Carrying Capacity**	*Facilities*	*Facility Standards*
Picnic Sites							
Democrat Island	Limited active and passive land-based recreational day-use activities	42 ha	2 ha/site; 5 units/site; 8 people/unit	Soil depth	2 picnic sites	20 garbage receptacles, 20 tables, 10 charcoal cookers, 2 privies	1 garbage receptacle/ unit; 2 tables/ unit; 1 charcoal cooker/unit; 1 privy/site
Buck Island	Limited active and passive land based recreational day-use activities	30 ha	2 ha/site; 5 units/site; 8 people/unit	Soil depth	1 picnic site	10 garbage receptacles, 10 tables, 5 charcoal cookers, 1 privy	
Browns Island	Limited active and passive land-based recreational day-use activities	10 ha	2 ha/site; 5 units/site; 8 people/unit	Soil depth	1 picnic site	10 garbage receptacles, 10 tables, 5 charcoal cookers, 1 privy	
Big Bluff Island	Limited active and passive land-based recreational day-use activities	5.7 ha	2 ha/site; 5 units/ site; 8 people/unit	Soil depth	1 picnic site	10 garbage receptacles, 10 tables, 5 charcoal cookers, 1 privy	
Crow Island	Limited active and passive land-based recreational day-use activities	9.8 ha	2 ha/site; 5 units/site; 8 people/unit	Soil depth	1 picnic site	10 garbage receptacles, 10 tables, 5 charcoal cookers, 1 privy	
Deer Island	Limited active and passive land-based recreational day-use activities	60 ha	2 ha/site; 5 units/site; 8 people/unit	Soil depth	3 picnic sites	10 garbage receptacles, 10 tables, 15 charcoal cookers, 1 privy, 3 km of nature trails	

***Note:** The carrying capacity is not related to the size of the island.
Sites were chosen objectively and the requirements for the choice of a site relate to environment, cover and size.
The use standard gives an indication of how many persons can be accommodated on those sites selected as suitable for this activity.

Reforestation will be carried out as part of a site rehabilitation program. Fish and wildlife management will be carried out as part of the district management plan for Charleston Lake. Research may be carried out in accordance with Ministry policy. In addition, efforts will be directed toward resolving land ownership of the islands in the zone in order to bring them under regulation as soon as possible.

Historical Zone

This zone comprises 39 ha on the southeast corner of the peninsula which is bounded by Slack Bay and Runnings Bay. It includes the Gordon rockshelter and the Jackson's Point rockshelter, two Indian encampment sites and two relatively insignificant historic agricultural settlements and a 2.4-km Pioneer Interpretive Trail. Other sites outside of the defined historical zone include the Slim Bay Gap site, the Runnings Bay pictographs, Bloggett Point, Captain's Gap, Kernel Shore and Medole's Point. These are in natural environment zones and will be designated as historical areas.

Interpretive and educational programs within the historical zone will be developed and controlled in conformity with the management plan prepared by the consulting archaeologist in 1975. The uniqueness and fragility of the archaeological resources in the historical zone require strict management to protect against overuse and competent staffing to provide on-site interpretive experience.

The resources of the historical zone will be managed in conformity with an historical resources management plan. To prevent degradation of the sites, the zone will be closely monitored and the management plan will be altered as required. There will be no alienation of land by lease or sale within the zone.

Study of the historical zone is of high priority and will be encouraged according to the Ministry guidelines on research and according to the interpretive plan for the historical resources of Charleston Lake done by Swayze in 1975.

Plan Concept

Development and programming will provide activities oriented towards destination users, while at the same time conserving the natural environment. Sensitive designs and layouts will provide facilities to optimize the user's experience. Such facilities are identified in Figure 14.

A visitor services program will be developed to interpret the natural and cultural environment and to encourage active outdoor recreation. These facilities and programs will encourage the visitor to explore, discover and appreciate the rich and varied landscape of the Charleston Lake area.

Visitor Services

The features of the Charleston Lake planning area, as well as the facilities and activities which could utilize the area's resources, would together produce a very rewarding experience for any visitor. Visitor-oriented programs and information services should reflect the park's dispersed recreational opportunities. In addition, the visitor services programs will closely reflect the park objectives and conform to regional and provincial priorities as outlined in the proposed regional visitor services plan. The plan will promote programs appropriate to destination users.

The significant themes at Charleston Lake Provincial Park are archaeology and floral succession associated with the north-south Shield transition. The major themes around which the visitor services program will be organized include:

(1) North-south Shield transition (flora)
(2) Prehistory (archaeology)
(3) Frontenac Axis (geology)
(4) Nineteenth century recreation history

Charleston Lake Provincial Park and nearby Murphys Point Provincial Park and Frontenac Provincial Park provide three different types of recreational experiences. However, when these parks are taken in a regional context and linked through regional programming, they can develop independently, providing exciting park programs which highlight the individual resource features and yet include and complement the other areas. Murphys Point could feature the Rideau Waterway, the Rideau Trail and early mining in the area; Frontenac, the geomorphology and the Rideau Trail which runs throughout; and Charleston Lake, the geology, archaeology and history of the resources and human activities of the region.

A broad visitor services program will be developed to provide information to park users, to interpret the theme package of the park, to provide a classroom and resources for outdoor education and to promote recreational skills in the activities featured in the park program. Visitor services for all parks in Ontario are presently defined in terms of recreation programming, communications, interpretation and outdoor education. At Charleston Lake Provincial Park, these four elements will be developed in the following manner.

The communication portion of the visitor services program will act as the core directive for the other elements. It will immediately establish and stress the natural and historical interpretative theme and outdoor recreation skills development. This will be done by means of park-generated, low-cost pamphlets, brochures and publications.

These park-based publications will deal with:
- public awareness of park operations
- park layout
- park classification
- specialized aspects of the park's resources
- recreational skills development

Higher quality publications will include:
- flora and fauna
- Charleston Lake archaeology
- geology and the Frontenac Axis
- history and landscape
- resource studies
- educational policy and programs at Charleston Lake Provincial Park
- regional experience package
- maps

The intent of these publications will be to foster exploration of the park and to encourage direct encounters with the park resources.

The interpretation portion of the program will emphasize the fragile nature and singular qualities of certain resources in the Charleston Lake area. Conducted hikes and tutorial sessions represent the approach which the management will take to interpret and to ensure the protection of these sensitive qualities. For instance, the Charleston Lake rock shelters are an example of resources which require well-defined management guidelines for their protection and interpretation. In addition, where applicable, marked trails, self-guided facilities and displays will interpret the story of the resource or facility. Park users will make use of the amphitheatre and display area currently located in the park office.

Recreation programming for the Charleston Lake area will promote canoeing as an interpretive medium. There are excellent opportunities for the individual to learn canoeing while developing an appreciation for the park. Canoeing is one of the best ways to explore Charleston Lake's deep bays. There is also considerable potential for connecting into external canoe routes on the Gananoque River. Canoeing instruction at Charleston Lake is an important way of helping to fulfill the park's objectives. In addition, recreation programming will develop facilities which encourage dispersed, year-round use and an understanding of the area.

Master Plan

- Proposed park boundary
- Visitor centre
- Comfort station
- Parking
- Playfield
- Creative playground
- Group campsite
- Interior campsites (no. of sites)
- Beach
- Picnic site
- Wayside stop
- Boat launching site
- Boat landing site
- Boardwalk
- Amphitheatre
- Pump house
- Shelter

Summer Trails

- Hiking
- Back-packing

Winter Trails

- Cross-country skiing

Year-round Trails

- Walking — snowshoe
- Hiking — snowmobile
- Hiking — snowshoe
- Portage — snowmobile corridor
- Multiple-use

Outdoor education programming will encourage the involvement of formal education groups, special groups and other informed park users. A display area and amphitheatre will be provided for their use. A formal visitor centre will be developed in the near future, of a size appropriate to the theme of the park and consistent with the needs of group educationists and winter trail users.

Management Guidelines

Outdoor Recreation Management Guidelines
Recreation development will be extensive in nature to accommodate dispersed, resource-oriented activities. The degree of development and use will be of low to moderate intensity. Dispersed land-use will be the principle for development and use.

A variety of activities will be spread over a wide area according to the recreational capability and the physical limitations of the resources. Where conflicts exist between adjacent land-uses, fences will be erected, and areas will be marked for activity separation. Where special regulations for boaters are to be enforced, the water boundary will be indicated as such with buoys. Signs will be posted wherever necessary (especially with respect to hunting and restricted use).

Various methods of travel will be permitted in the park. However, the roads, trails and zones will be designated for specific modes of travel as permitted. Motorized equipment may be used for management and enforcement purposes throughout the park.

Firearms will be permitted in designated hunting areas during regular open seasons for upland game and waterfowl. These areas will be indicated for the safety of other park users. A suitable visitor services program will be developed to interpret the approach to outdoor recreation activities most beneficial to the user.

Resource Management Guidelines
A forest management plan will be prepared for the park by the District Manager. Reforestation and silvicultural treatment will be in accordance with the plan. Special attention will be paid to the protection and preservation of the pitch pine stands, and research on these stands will be supported. Fire detection and suppression will be carried out as required to protect the resource. Insect and disease control will be carried out when and where required. A management plan for the fish and wildlife resources in the park will be prepared by the District Manager. Enforcement, regulation, management (including stocking and habitat manipulation), research and trapping for control purposes will all be carried out according to this plan. Special attention will be paid to the protection and preservation of the black rat snake. Research on this species will be supported.

The motive for resource utilization will be the maintenance and enhancement of park values and the achievement of resource management objectives. The extraction of resources will be according to guidelines set down in management plans for the park. (For example, the forest management plan may indicate certain silvicultural treatments to maintain a viable stand of white pine. This may produce a saleable wood product.)

Disposition of park land will not be permitted. Control measures for drainage and erosion will be instituted whenever necessary to protect park values. Access to park facilities will be provided and maintained.

Additional lands may be acquired to expand or improve programs and to protect significant natural or cultural features.

Efforts will be made, in conjunction with other Ministry and government programs, to protect Charleston Lake from overdevelopment. Water quality will be maintained or enhanced through development control and systematic monitoring.

A suitable visitor services program will be developed to interpret the resource management principles and practices in a manner which will be most beneficial to the user. Research will be supported where there is no threat to the resource and where knowledge gained will be beneficial to the park, the Ministry or other government programs. Research on pitch pine and the black rat snake will be encouraged and supported.

Operations and Facilities

Staffing

The proposed park staff requirements are indicated in Table 15. The organization of the staff is shown in Figure 15.

Water Supply
The drinking water used within the provincial park boundaries comes from Charleston Lake and is chlorinated. It is provided by a central pump house and distribution system. The water will be tested on a regular basis to ensure public safety. Water for the sewage system also comes from Charleston Lake.

Sanitary Facilities
Washrooms are provided to service the developed day-use areas and campgrounds. There are four comfort stations, supplemented by pump-out vault privies. The comfort stations are constructed with tile beds. There are laundry facilities in each comfort station. There are no shower facilities at present. Facilities to accommodate handicapped visitors will be provided.

An ample supply of waste containers will be provided to service adequately the developed day-use areas, campgrounds and other locations throughout the park. These will be emptied on a regular basis by maintenance staff.

Electricity
There are no electrical sites provided in the park at the present. There are plans, though, to electrify twenty-five campsites in Meadowlands Campground.

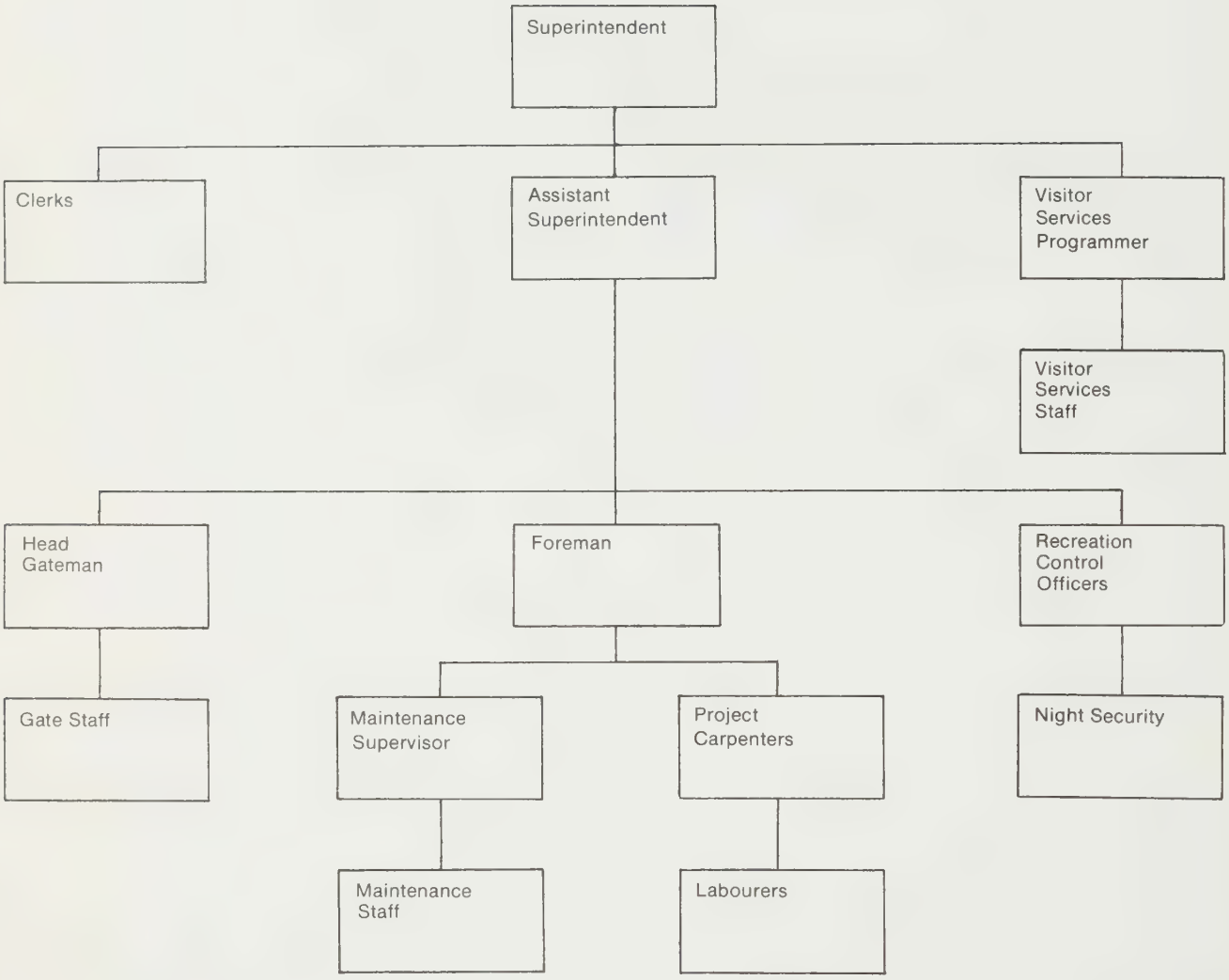
Telephone
A public telephone is provided at the campground office.

Emergency
All reasonable precautions will be taken to ensure the safety of park visitors. A comprehensive emergency services plan has been developed including a communications network, first aid within the park, fire protection agreement with the Lansdowne Fire Service, police protection and ambulance service to the park. Portable fire fighting equipment such as pumps, hoses and hand tools are provided within the park. Park staff will be thoroughly trained in fire prevention and fighting procedures.

Table 15: Staffing

	Present	*Phase I*	*Phase II*	*Phase III*	*Final*
Permanent					
Superintendent	1				1
Assistant Superintendent	1				1
Visitor Services Programmer		1			1
Clerk		1			1
Maintenance Foreman			1		1
Recreation Control Officer				2	2
Sub-total	2	2	1	2	7
Casual					
Sub-Foreman	2	1			3
Clerk	1		1		2
Maintenance	6	2	4		12
Interpreters	1		1	1	3
Security	1	1	1		3
Meadowlands Campground Staff	6	(—2)			4
Park Gateman		5			5
Sub-total	17	7	7	1	32
Total	19	9	8	3	39

Staff Organization



Plan Implementation

Phasing

The additional developments, equipment, land acquisition and staffing will be incorporated as recommended in three phases as shown in Table 16.

Each phase should be complete before the next is commenced. The time frame for each phase is as yet unknown, although it is recommended that Phase III be completed in the 1980-81 fiscal year.

Management Plans

Implementation of the master plan for Charleston Lake will require the development of and adherence to a set of management plans which follow guidelines outlined earlier. These include:

Outdoor Recreation Management Plan
1 Site design and development
2 Visitor services
recreation programming
communications
interpretation
outdoor education
3 Park operating and maintenance

Resource Management Plan
1 Forest management
stand improvement
reforestation
landscape stock
fuelwood plan
2 Fish and wildlife management
habitat improvement
regulations
stocking
3 Lands and waters management
4 Historical resource management

Of the above mentioned plans, the ones presently in production are:
- Site design and development
- Visitor services
- Historical resource management

The others will be undertaken as soon as possible.

Monitoring

Changing circumstances, evolving public needs, park use and environmental impact will be considered during detailed reviews of the master plan at least every five years. A monitoring process will be designed which will provide Ministry staff with a continuous flow of relevant information about park usage, level of public acceptance and environmental impact so that appropriate adjustments can be made to the plan and to the park's operation.

Table 16: Development Costs

	Phase I	*Phase II*	*Phase III*	*Total Cost*
Development Zone	*76,900*	62,500	6,000	145,400
Natural Environment Zone I	18,600			18,600
Natural Environment Zone II	10,500	15,000	5,000	30,500
Natural Environment Zone III		16,500		16,500
Nature Reserve Zone	2,000	2,000	2,000	6,000
Historical Zone	10,000	40,000	20,000	70,000
External	2,500	6,000	5,000	13,500
Total	$120,500	$142,000	$38,000	$300,500
Summary of Equipment Costs	*Phase I*	*Phase II*	*Phase III*	*Total Cost*
	$31,500	$3,100	$6,000	$40,600
Summary of Land Acquisition Costs	*Phase I*	*Phase II*	*Phase III*	*Total Cost*
	$200,000	$200,000	$100,000	$500,000
Summary of Implementation Costs	*Phase I*	*Phase II*	*Phase III*	*Total Cost*
Development	120,500	142,000	38,000	300,500
Equipment	31,500	3,100	6,000	40,600
Land Acquisition	200,000	200,000	100,000	500,000
Total	$352,000	$345,100	$144,000	$841,100

References

Anon. *Historical Atlas of Leeds and Grenville.* Kingston, Ontario: Putnam and Walling, 1861-2.

Beschel, R.E. "Comments on the Vegetation of the Kingston Region." *Blue Bill* (Quarterly Bulletin of the Kingston Field Naturalists), 12: 32-36, April 1965.

Bond, I.J. and R.G. Griggs. "Revision of the March Formation (Tremodocian) in Southern Ontario." *Canadian Journal of Earth Science,* 10: 1140-1155, 1973.

Canada Department of Environment. *Temperature and Precipitation 1941-1970.* Ottawa, Ontario: Canada Department of the Environment, 1971.

Canada Department of Indian Affairs and Northern Development. Parks Canada. National and Historic Sites Branch. *Canadian Outdoor Recreation Demand Study.* Ottawa, Ontario: Canada Department of Indian Affairs and Northern Development Tech. Note 22, 1973.

Chant, Edna B. *Beautiful Charleston.* Belleville, Ontario: Mika, 1975.

Chapman, L.J. and O.F. Putnam. *The Physiography of Southern Ontario,* 2nd ed. Toronto, Ontario: University of Toronto Press, 1966.

Clement, S.M. *Charleston Lake Provincial Park Earth Science Report.* Toronto, Ontario: Ministry of Natural Resources, Environmental Planning Series, 1974.

Cobus, M. and J. Weiler. *Interim Interpretive Plan for Charleston Lake.* Toronto, Ontario: Ministry of Natural Resources, 1972.

Earle, E.P. *Leeds the Lovely,* 2nd ed. Prescott, Ontario: St. Lawrence Printing Co., 1974.

Froom, B. *Ontario Snakes.* Toronto, Ontario: Department of Lands and Forests, 1967.

Gillespie, J.E., M.H. Millar and Q.E. Wicklund. *The Soils of Leeds County.* Ottawa, Ontario: Canada Department of Agriculture and the Ontario Department of Agriculture and Food, Ontario Soil Survey, Report Number 41, 1968.

Gordon, R.L. *Charleston Lake Rock Shelter.* Toronto Ontario: Department of Lands and Forests, 1967.

Harvey, L., N. Helling, D. Lichtenfeld, and H. Winkenback. *Charleston Lake Inventory* (unpublished data sheets) Toronto, Ontario: Ministry of Natural Resources, 1970.

Hewitt, D.F. *Geological Notes for Maps 2053 and 2054, Madoc and Gananoque Area.* Toronto, Ontario: Department of Mines, Geological Circular Number 12, 1960-61.

Millar, M.S. *Natural Resources Appraisal for Land Use Planning.* Ithaca, N.Y.: Cornell University Press, 1972.

Ontario Ministry of Natural Resources. *Administrative Policies of the Ontario Provincial Parks System.* Toronto, Ontario: Ministry of Natural Resources, 1975.

Ontario Ministry of Natural Resources. *Ontario Provincial Parks Landscape and Design Guidelines and Standards.* Toronto, Ontario: Ministry of Natural Resources, 1976.

Ontario Ministry of Natural Resources. *Ontario Provincial Parks Statistical Reports.* Toronto, Ontario: Ministry of Natural Resources, 1972, 1973, 1974, 1975.

Ontario Ministry of Natural Resources. *Tourism and Outdoor Recreation Planning Study.* Toronto, Ontario: Ministry of Natural Resources, 1975.

Ontario Ministry of Natural Resources. *Sensitive and Special Areas Report.* Kemptville, Ontario: Ministry of Natural Resources, 1972.

Swayze, J.K. *Interpreting the Historical and Prehistorical Resources of Charleston Lake Provincial Park.* Toronto, Ontario: Ministry of Culture and Recreation for the Ministry of Natural Resources, 1975.

Swayze, J.K. *Management of the Historical and Prehistorical Resources of Charleston Lake Provincial Park.* Toronto, Ontario: Ministry of Culture and Recreation for the Ministry of Natural Resources, 1975.

Swayze, J.K. and P. Bridges. *The Archaeological Survey of Charleston Lake Provincial Park.* Toronto, Ontario: Ministry of Natural Resources, 1973.

Van der Kloet, S.P. "The Biological Status of Pitch Pine, Pinus rigida Millar, in Ontario and Adjacent New York." *Canadian Field Naturalist,* 87: 249-253, 1973.

Van der Kloet, S.P. "Occurence of Phus copallina in Leeds County, Ontario." *Canadian Field Naturalist,* 82: 291-293, 1968.

Wynne-Edwards, H.R. *Geology of the Tichborne (East Half) Area.* Geological Survey of Canada, Paper 64-56, 1965.

Young, C.J. "Notes on the Natural History of the Blue Mountain, County of Leeds, Ontario". *The Ottawa Naturalist,* 5: 45-51, 1891.

Ontario

Ministry of Natural Resources

Hon. Frank S. Miller
Minister

Dr. J.K. Reynolds
Deputy Minister

March, 1978

5658

77-4970